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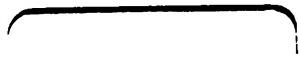
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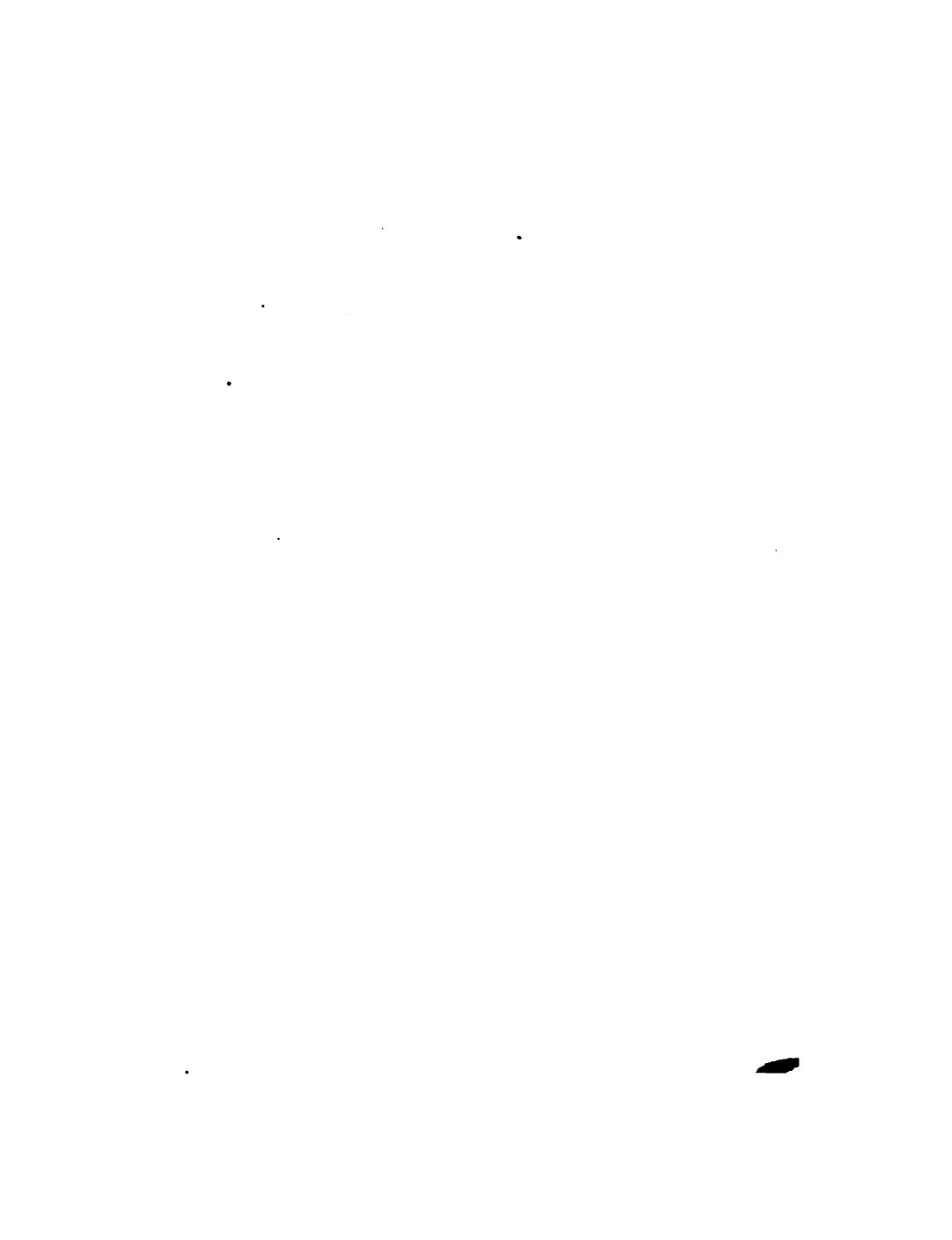
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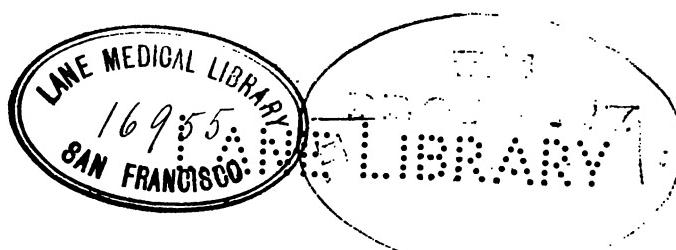
MASSAGE.

PRINCIPLES AND PRACTICE OF REMEDIAL
TREATMENT BY IMPARTED MOTION.

MECHANICAL PROCESSES.

BY GEO. H. TAYLOR, M.D.

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"PELVIC AND HERNIAL THERAPEUTICS," ETC.



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PREFACE.

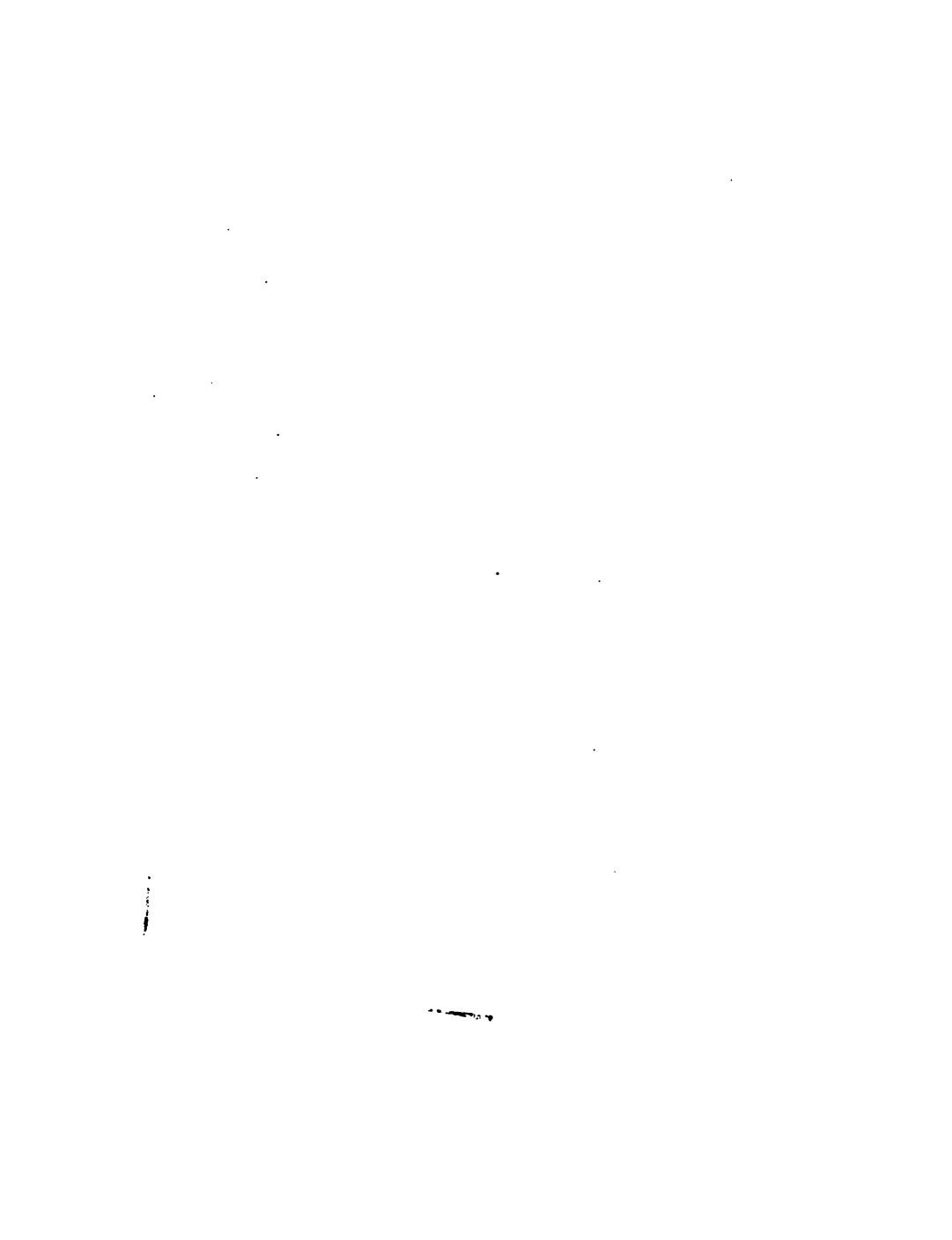
The urgent needs of the chronic invalid for help, with his traditional respect for the generous intentions of the medical profession, often lead him into serious difficulties. His faith easily becomes indiscriminating, and he accepts remedies of inferior value. He thus evinces a contempt for his personal power of observing, reflecting, judging, and choosing in matters of highest personal interest, which would be decidedly to his discredit in the ordinary affairs of life.

It is not only possible, but abundantly feasible for even the invalid to inquire into and secure a competent working knowledge of his physiological defects, their sources, and, hence, their needs. Physical suffering and ineptitude, more than all things else, should invite and guide these inquiries. He may even search out the fundamental sources of the outward manifestations, and learn to distinguish them from their impressions on his consciousness. He will be surprised to find that he not only thereby obviates ill health, but also dries up the sources and extracts the stings of that unwittingly brought upon himself.

It is with views such as these, that the claims of the most abundant, universal, potent, and, at the same time, natural and innocuous of remedial agencies has been indited, and are herein offered to the health-seeking public.

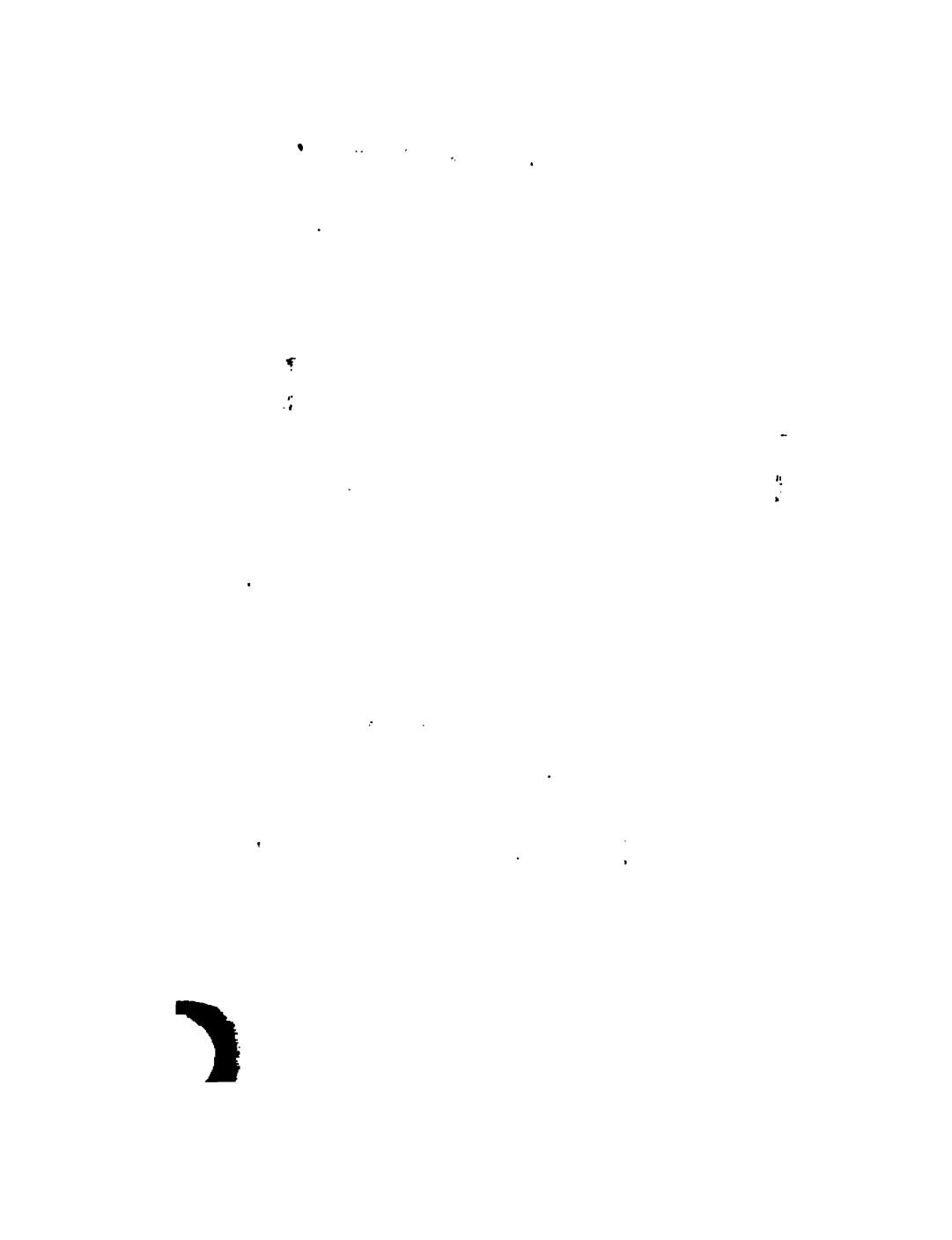
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MASSAGE.

The word *massage* denotes any process of conjoint motion and pressure applied to parts of the living body, for remedial purposes. Massage implies some source from which the pressure-motion is derived and involves the production of physiological consequences adapted to remedy defects arising from insufficient muscular action of the usual forms.

The most casual observation of the living body will afford suggestions at least as to how *communicated* motions, or to speak more precisely *motor-energy*, becomes available for the needs of the vital system, to such a degree as to constitute it a true remedy.

When one raises a weight, the act visible to the eye is but a fragment of the actual process. For another weight could be so placed as to do the same thing in appearance. But in case of the vital performance, the gravitating force is caused to extend through the arm, the body and limbs to the feet resting on the ground. A series of muscular fibers have been caused to act, whose cells divided

between them an amount of motor-energy equal to the gravitation of the weight. The action of the muscles has caused displacement of the fluids in which the muscles are bathed, and by which their power is supported. Will-power has been engaged to incite the muscles. Both muscles and nerves have suffered change of substance to a degree corresponding with the energy applied in opposition to gravitation, and not least, more air has been respired and more oxygen extracted therefrom by the blood, because, in the act described, the blood parts with a notable amount of oxygen. Such are the interior processes which are in all cases the necessary concomitants of the manifestation of motor-energy. The central act is the change of shape of a multitude of muscle cells under the incitation of the will; the others are consequences thereof.

Now, massage produces similar physical and nutritive changes in the muscle cells, in the circulation of the blood, in the securing of oxygen from air respired, and the general physical consequences arising from them. But it employs exterior physical impressions and expenditures, and dispenses entirely with nerve influence. Such communicated motion and pressure not only cause the same interior consequences, but are capable of carrying

them forward to the degree demanded for health.

Considered in the light now presented, nature sets the example and teaches the lessons of massage in every healthy organism. For the vital organism is, itself, an arena for never-ceasing, spontaneous motions; even for motions which have no exterior purpose or significance. These are the involuntary muscular actions, as those of respiration, of the heart and blood-vessels, of the digestive organs, and a multitude of lesser activities. The effects of these actions inure solely to the benefit of the physiological system. These benefits arise from the transformation of the motor-energy, initiated by the muscle cell, to other useful forms and purposes.

The primary effects of such muscular actions as are in the highest sense *voluntary*, are interior effects; a residuum only reaching the exterior of the body for expenditure on external objects. Voluntary activity therefore serves to heighten, strengthen, and carry forward to greater perfection, the pre-existing, involuntary acts. Nature demands this before motor-energy is suffered to leave the vital organism. Without the reinforcing acts consequent on the incitations of the will, or volitional power, there is a marked tendency

of the involuntary powers to decline and become insufficient for nutritive requirements.

The activities of all classes of muscles evolve energy of the motor variety, no part of which is wasted or lost, but the whole becomes available to the organism. These motor effects converge at one point, expressed by the word *nutrition*. They serve for the support of the *vital cell*, from which energy is finally evolved, and for the disposal and discharge of the materials from which energy in its different forms is separated, and from which the powers of the individual are derived. While the apparent motion ends, its equivalent remains embodied in advancing stages of the nutritive processes. Through the instrumentality of automatic motor-energy the details of physiology are perfected; and so a surplus of power for external use becomes possible. When any part of such physiological detail becomes imperfect, the fact is instantly indicated by a curtailment of exterior manifestations of motor and, indeed, of other forms of energy.

The above physiological detail indicates not only what becomes of the motor-energy liberally expended within the vital organism, but also, the necessity for an equally liberal provision on the part of nature of a physiological mechanism suitable for the purpose. An indication

is also afforded of the nature of the consequences liable to follow an insufficient supply of these motor requirements, and a strong suggestion of the feasibility of supplying by art the motor defects which are liable to occur.

The interior expenditures of motor-energy which have been referred to, are always accessory as well as preliminary to exterior expenditures. The latter may be regarded as the overflow of the former, inasmuch as exterior manifestations are impossible unless preceded by the requisite amount and degree of the interior actions described. To this end, the involuntary muscular actions require to be constantly extended, deepened and reinforced by those arising in the voluntary system. Otherwise the equivalent effects derived from communicated motions may be required.

A further characteristic of the interior involuntary motions, upon which the train of nutritive processes appears directly to depend, is their peculiar form. They are what, in mechanical phrase, are called *reciprocating*; that is, motions constantly repeated over a short linear space, to and fro or wave-like motions. If the waves, or distance traversed, be short and quick, the word *vibratory* expresses the form of the motion.

Now, vibratory or reciprocating is the

form of communicable energy in general, as occurs in the engine, heat, light, etc. Massage is reciprocating motion having variable rates and degrees of pressure. On these subordinate particulars many of the special effects of massage depend. And these effects consist in general in the resolution of the communicated motor-energy into forms subservient to nutritive purposes.

The processes of massage are therefore entirely similar to the motions which occur naturally and spontaneously in the vital organism in health, and have a similar purpose, viz., the promotion of nutritive acts, the source of the powers of the organism. The justification of the supply by art of motor-energy under the name of massage, is because of its partial failure as a natural and spontaneous development.

The artificial supply of motor-energy admits of being directed to special ends. When it is known that some special organ or function is defective, such assistance may be made available for that part. The supply from artificial sources is under perfect control as to its degree, rate, and extent. It is perfectly adjustable to the needs of the part and of the organism. It is independent of the will, the exercise of which is not in the least required, and

nervous expenditures are therefore economized to the utmost. It is adapted to invalids perfectly helpless, as to locomotion or other voluntary action of any kind. And it is the source of marked increase of capacity of all the powers connected with nutritive defects or nutritive perversion.

MANUAL MASSAGE.'

The fundamental principles underlying massage are natural, having their type and exemplar in those involuntary motions of the organism which afford the primary impulse to nutritive acts. Nothing can therefore be more natural and timely than the contributions of the abundant power of the strong and well to supply the defects of the weak and infirm.

The motor power of the human hand easily lends itself to this generous purpose; and it thus, almost by instinct, but in strict conformity with scientific principles and purposes, reinforces the vital needs and waning energies of the suffering.

These acts of the hand, when directed by intelligence, constitute *manual massage*.

The *rationale* of manual massage may be

understood in a general way by persons unversed in medical and scientific subjects. It is easily comprehended that the interior physiological activities, to maintain which we breathe air and take food, result in power or energy which finds expression in motor acts of the muscles, guided by the will. This is motor energy, and it is *transferable*. It is only necessary that it meet *resisting* objects; and that the power moving the hand is transferred to such objects, becomes evident by its participating in the motion. The power of the hand then inures to the advantage of the resisting body.

But in case of the vital organism of another person, the resisting object is divided into an infinity of parts, which are not strictly adherent or cohesive, but are at liberty to freely move within certain limits independent of each other. It follows that the transmitted energy is expended on this diversity of parts, each minutest atom of which is affected by the accession. The motion given is received by the fluids, the semi-fluids and solids which compose the patient's body. These ingredients of the body, which are invisible by their minuteness, offer resistance, and therefore receive the accession of power or energy. But these minute parts have physical constitutions of their own, differ-

ing widely from each other and therefore become differently affected by what is thus transferred to them. A portion of the motor impulse engages with fluids and continues unaltered. But a larger portion becomes fixed in connection with substances it meets. It becomes incorporated, assuming other forms of energy. It establishes new relations, predestined by the physics both mechanical and chemical of the vital organism. The motor energy communicated by the hand of another person, having assisted the varied physiological processes, finally emerges from the vital organism in some form of expenditure of energy, and in perfected products of waste derived from the materials which have served nutritive purposes.

The reader cannot but observe the resemblance of this series of activities—the origin, transfer and expenditure of the powers of the living body—to that now familiar object the *dynamo*. This machine gives motor expression to energy collected from some adequate source of power, transfers it to a like mechanism, and by the second machine it is expended in useful work.

REMEDIAL EFFECTS OF MANUAL MASSAGE AND THEIR
LIMITS.

The imparted motion of manual massage and the automatic motions of any muscular part of the body are similar in rate and extent. The pressure of the hand of the operator, and the compression of included tissues by muscular contraction, are also similar in form, degree, and effect. Massage, therefore, to this extent resembles exercise, and its effects are hygienic rather than medical. Like the consequence of exercise, aid is afforded to the circulation of the blood and to its general diffusion; assimilation is promoted, oxidation assisted, muscles developed, and the nutritive processes in general extended and refreshed.

There are, however, important practical differences between the nature and effects of *imparted* motion and pressure, or *motor-energy*, as it may be distinctively called, and exercise, as this word is commonly used, which remove the former from the category of hygiene, and give the processes of manual massage distinct and unequivocal remedial powers and a high, because otherwise unoccupied place among the resources of the medical art. These powers and functions of manual massage may be briefly noticed.

The most significant characteristic of manual massage is that it entirely dispenses with the agency of the will, or indeed, of any function of the nerves whatever, on the part of the one receiving the processes. Since nutrition inevitably succeeds action in physiological processes, it necessarily follows that the *course* of nutrition, and therefore, of nutritive results, is profoundly altered by excluding the nervous action.

In ordinary exercises, the nervous incitation and the muscular action are in harmony, and the nutritive support distributed to the *sources* of the two forms of energy are also proportional to their participation in the act respectively.

Applying the same law of proportion of nutrition or nutritive support to action, it will be seen that the whole nutritive consequences of manual massage must inure to the muscles and whatever else directly or incidentally contribute to the support of the muscles and their powers.

It will be at once understood how this principle may become available, remedially, as nothing else is, or in the nature of things can be, for the relief of nerve centers wherever located. The hyperæmia superinduced by overaction and abuse of the nervous powers, has, in these processes, an antagonizing agent; and the

grave disabilities, and even diseases of the nerve centers have, in manual massage, an unequivocal remedy of superior efficacy.

The processes of manual massage can, when desirable, be localized, and corresponding localized effects may therefore be attained in a high degree. This principle of localization of nutritive effects is remedially available in several ways.

By *localizing* massage and concentrating the physical impressions at some special region of the body, the nutritive response becomes correspondingly localized. This principle is available for increasing the amount of blood in any part when such increase is desirable; for increasing the development of such portions as suffer from acquired, or even congenital defects; and for restoring defects of any special functional apparatus, as the chest, the digestive organs, or portions of the nervous system.

No less available and practical is this principle in its application for the removal of *excess* in any local region of the body. Excess of blood in the head is removed, by employing it in functional duties in other portions of the body. Hyperæmia of the spine, of the chest, distention of the large blood-vessels, including the heart, are all directly and practically ameliorated and progressively removed by gently

and persistently engaging the circulation in other than the affected parts, till balance is restored and recovery complete. No remedy of the pharmacopoeia is adopted to produce the same remedial effects either to the same extent or degree of permanency.

For the purposes last mentioned the observation of certain rules of application, based on physiology, is necessary to success.

Manual massage is much used remedially in affections of the nervous system, functional and organic. The power of its processes for profoundly affecting the nerves is undoubtedly and easily demonstrated. Whether it be *wisely* used in nervous conditions depends very much on the intelligence of the operator. When applied with direct reference to making the recipient *feel better*, as drugs are sometimes used to induce agreeable sensations without reference to the physiological consequences and habits superinduced, it becomes of questionable value. When applied with full understanding of the sources of nervous power and of the relation of nervous to other functions, and of the means of strengthening or changing these relations, as there may be need, manual massage becomes of great remedial efficacy.

Manual massage always has been and necessarily must be largely used in the correction of

chronic deformities of the limbs. Its value in this respect arises in part from producing contrary effects from those produced by exercise. For, whereas the latter serves to cause coalescence of the muscular fibers, to bind them together in every muscular act, massage is easily so applied as to produce gradual *divulsion* or separation, to the extent of destroying marked adhesions and the contraction and deformation depending thereon. It also antagonizes the effects of instruments now often applied to *conceal*, rather than to remedy deformities, whether of the spine or limbs. It causes development to replace the repression of instruments, and affords practical information as to the true nature and needs of this whole class of infirmities.

No remedial effects should be expected of manual massage, either in degree or kind, that are outside the range of the natural powers of the human hand. The source of the operator's capacity for expenditure lies in the capacity of his vital system to evolve energy. The *rate* of motion he can supply is fixed within very narrow limits by peculiarities of the mechanism of the body; many of its motions being controlled on the general principle of the pendulum, cannot, for any considerable time, become successfully either accelerated or reduced.

What other effects, remedial or otherwise, *might* be produced by other rates of delivery of motor-energy than those of which the hand is capable, cannot logically be predicated from what is known of its effects. *Other* experience is required to determine these facts.

For further details of manual massage, including description of methods and processes, and their effects, special and general, together with full statement of principles to which reference is made above, the reader is referred to Dr. Taylor's book, entitled *Massage, Manual Processes*, to be obtained at book-stores, also of the publishers, Fowler and Wells Publishing Co., 753 Broadway, New York.



MECHANICAL MASSAGE, AT SLOW RATES OF MOTION—KNEADING.

While the vital organism derives the materials which it expends in functional duties from the central interior mass which constitutes the digestive apparatus, the functions of this apparatus appear to be inadequately understood, and often practically very much misunderstood. It is elsewhere shown that the nutritive activities which give occasion for digestion, depend far less upon the digestive organs than on acts of expenditure. So also the digestive secretions are far from being the sole requisite for the total act of digestion. It is indispensable that the secretions and food be brought into contact, and that the conditions for the due renewal and also the orderly succession of the necessary secretions should be supplied. The secretions are incapable of digesting in the absence of these conditions. It follows that remedies adapted to the secretory function alone, fall far short of the requirements for remedying indigestion, and can be of no more than evanescent value. The plying of the digestive organs with digestive remedies, diverts attention from the more

pressing needs of these functional parts, and serves to foster neglect and ignorance of the true requirements of these important organs.

It is plain that the whole visceral mass in the cavity of the body has a basis of structure, that its anatomical parts are composed of muscular, connective and membranous tissues, nerves and vessels. On these tissues the secreting glands depend, and it is these that suffer neglect and fall into a deteriorated condition; it is these which require development and strength on the same principle, for similar reasons, and through essentially the same use of the same means as applies for the restoration of deteriorated powers of the limbs and trunk.

The motor functions and motor uses of the various parts contained within the cavity of the trunk, are even more tributary to the general health and well-being than those of the trunk and extremities. Yet the motor capacities and motor habits of the latter are most neglected by the otherwise intelligent classes. One of the essential conditions for digesting food is the motor power and action of the local digestive organs; yet the exercise, much more the cultivation of these motor powers after having become deteriorated by neglect, are seldom thought of. The common remedies which spur the mucous secretions or the nervous irritability

of these parts have no relation whatever to the defects or the needs in question.

A brief consideration of patent facts shows that the motor functions to which the digestive organs are adapted, are absolutely essential to digestion. The observer of the ordinary facts of physiology is thereby a student of remedies—a therapist in a better sense of this term.

The physical habits including even the *antics* of the lower animals, the nature and modes of the habitual motions and changes of position of working men and women of every class—all afford object-lessons in this study of the motor needs of the contents of the cavity of the body, and show how the functional duties of this central mass are maintained. Observations of this kind appear to indicate that the digestive organs require pretty frequent repetition of exterior, slow motor impulses with considerable alternation of pressure.

For, the digestive organs are by the natural and necessary movements of the body, subject to an enormous amount of *slow, passive motion*. All bendings of the trunk in any direction, and all twistings of the body in all ordinary occupations or recreations, subject its contents to gentle but strong mechanical compression from directions as varied as the motions. Each

compression is followed by relaxation, rendering the action double and reciprocating.

Whenever change of position is accompanied by considerable *exertion*, that is by action of the muscular extremities, as for example, in lifting, pulling, such as is, in fact, involved by all kinds of work, the compression is increased by the amount of the exertion; that is, in proportion to the will-power expressed in the act. Indeed, the alternation of compression of the visceral mass becomes doubled by effort. For, in addition to the compression from the muscles of the abdomen, the increased depth of respiration demanded for exertion, places these parts under a *second* pressure, that derived from increased and enforced respiratory rhythm. One lifting a heavy weight may observe how he puts the air in his lungs under compression by "holding his breath," in addition to the play of muscles due to the principal act. All acts of walking, riding, running, and even standing, subject the digestive mass to *vertical oscillations*, of which compression of varied degrees is one feature, and the gliding of the smooth glairy exteriors of these organs and parts of organs upon each other is another, also essential in another way.

In each case, whatever be the intent or the incitation, the digestive mass is subjected

to firm, slow alternations of compression and relaxation, and this consequence is intimately associated with the demand, by the organism, on the digestive powers for the support of the expenditure occasioned by such acts. It follows that digested materials are not well supplied to acting organs and functions if dissociated from the central effect of alternations of pressure.

These changes of action and alternations of pressure are connected with consequences which afford the student of remedies and of hygiene very necessary lessons.

The secreting office of the digestive organs is a constant source of solicitude, as is indicated by the multitude of remedies for their benefit, many of which are directly opposed to each other. There can be no mistaking the effects of the slow alternations of combined motion and pressure, which is a natural massage incident to the region. By all acts of the kind described, the formed secretions are gently urged from the ducts and glands which are their source, and conducted into the digestive cavity to meet the materials to be digested. This emptying of the glands is necessary to induce additional secretions. In the absence of outflow, secretions cannot form.

The capillary vessels which surround the secreting glands and supply the materials for

the secretions, are by the same act of compression and relaxation refreshed; the contents are urged forward, new supplies of blood flow in, and thus the conditions for maintaining the act are complied with. But renewal of the contents of the larger blood-vessels are equally necessary. The same motions with pressure are effective for urging onward the contents of even the largest vessels, overcoming all obstacles, including that of gravitation.

The muscular element of the walls of the digestive organs constitute a most important factor of the digestive act. It is by the motor power of these muscles that the digesting food is slowly brought into contact with the different segments of the digestive canal, and thus into relation with the varied qualities of digestive secretion which are afforded at different points along the course of the canal.

In this way each of the different components of food becomes exposed, in succession, to the special kind of secretion requisite for its digestion. This effect is secured only by the muscular function of the canal. The muscular power is always faulty in case of indigestion. It therefore always requires the remedial attention appropriate to the defect. It is scarcely too much to say the ordinary remedies contrib-

ute nothing whatever adapted to fructify the muscular powers of these organs.

The most satisfactory evidence of the necessity of a motor element for the digestive function is afforded by the fact that nature has carefully provided it in a special mechanical apparatus. It is the functional duty of the *respiratory rhythm* to impart motion to the whole digestive mass, and to each and all the individual organs which are engaged in the digestive act.

The rhythmic movements of respiration in health supply a slow but constant oscillation which, extending quite through the digestive organs, causes the different parts to glide upon each other. This act stimulates the contractile power of the muscle which enters into the composition of the digestive walls, and affords alternations of gentle compression and relaxation of the whole mass. This last act is indispensable in urging the venous blood along its channels, an effect which cannot be well secured when the rhythm is imperfect. This movement of venous blood returns the circulation from the abdomen and especially from the pelvis, and secures absorption both of digested food and of all surplus interstitial fluids, and of venous blood detained by gravi-

tation or by local obstacles, anywhere in the pelvis and abdomen.

Although the movements described are involuntary and spontaneous, yet voluntary acts in health constantly merge with, incite, support, and increase the effect of the rhythmic movements, and the latter become insufficient in extent and in degree in the absence of voluntary activity; and the digestive powers become impaired to a corresponding degree.

We are now prepared to understand how the different factors essential to digestion may be legitimately assisted, and how impaired digestive power, so far as this power depends on the local digestive organs, may be restored.

All muscular function is primarily change of shape of the muscle-cells which compose muscular fiber. Accompanying such physical change, there is a renewal of the contents of the muscle-cells so far as is required to insure repetition of muscular acts. This process constitutes muscular nutrition.

It is elsewhere shown (see *Massage*) that the nutritive effect of change of shape of the muscles is secured equally whether such change be incited by the ordinary nervous influence or by mechanical incitation; and that massage therefore becomes a certain means of renewing

muscular nutrition and restoring muscular vigor.

Slow Mechanical Massage is eminently adapted to fulfill the conditions above indicated, particularly as respects the abdomen. The points of superiority of the mechanical over manual forms of the process may be briefly stated:

The natural rate of motion of the voluntary muscles is considerably greater than is that of the involuntary which preside over the movements of the abdomen and its contents. The respiratory and the peristaltic movements are slower than those of the hand. It follows that motions, *natural* for the hand of a massage operator, do not so apply to visceral parts as to merge with and assist those of the latter. The *imparted* motion will not agree as to time with the pre-existing motion. This disagreement does not exist in case of the mechanical process.

The mass of the abdomen as a whole is too weighty to become subject in sufficient degree to mechanical effects produced by the unaided hand of a massage operator. He is unable to cope with the resistance, and discontinues his applications before remedial effects are even approached.

The position required of the patient for the

manual process, almost necessarily being that of lying on the back, is highly unfavorable to its success. It favors impaction of the abdominal contents, whereas separation is the effect desired. Kneading the abdomen in the backward lying position may prove highly prejudicial.

A moment's reflection will show why injurious effects are probable. In the position named the direction of the mechanical impulse is necessarily downward, toward the pelvis. The abdominal mass in the kneading act is forced upon the contents of the pelvis, urging these also in the same downward direction. The return flow of the contents of the veins, especially those of the portal system, is thus mechanically opposed, both by the process itself, and by the unnatural position into which the abdominal organs have been forced.

The motions imparted by an operator have in general a contrary direction to those of natural rhythm, and therefore oppose, instead of asserting and developing a more perfect degree of this natural function. While the kneading applied by the manual process has a general compressing effect, natural rhythm is always of a *lifting* character, and draws upward from the pelvis.



These combined disadvantages incident to manual kneading of the abdomen, are especially liable to cause injurious effects in case of pre-existing points of local *hyperæmia* or congestion, whatever be its special location, or by whatever technical name it may be called.

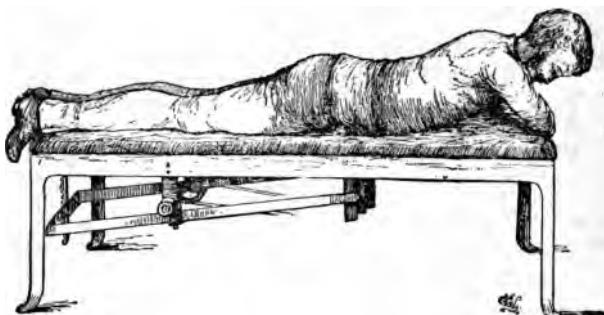


Fig. 1.

The mechanism for applying slow massage exactly reverses the manual form of the kneading process. The patient lies face downward. This position not only removes the weight of the abdomen from the pelvis but sends this weight in an opposite direction. There is an opening in the couch which allows the abdomen to become pendulous, and its contents are therefore perfectly free from compression.

The first stage of treatment required to clean the nostrils and draw pus from the nose is to make the movements of respiration more rapid and violent. The upward pressure of the diaphragm is sufficient to accomplish this, and it may be done by means of a simple instrument.



FIG. 2

caused by gravitation of the same parts. In this arrangement the action of gravitation does half the work; or more accurately, doubles the mechanical as well as the physiological effects of the kneading process. The rate of the motion is similar to that of the respiratory rhythm, practically merges with this natural act, and causes permanent increase of its efficacy. The physiological effect is that of not only stimulating the peristaltic movements, but also of cultivating the muscular development of the positive canal, and is too obvious to require

extended comment. The obstacles to natural action of the bowels are speedily and permanently removed by the application of either of the forms of the mechanical kneading here described.

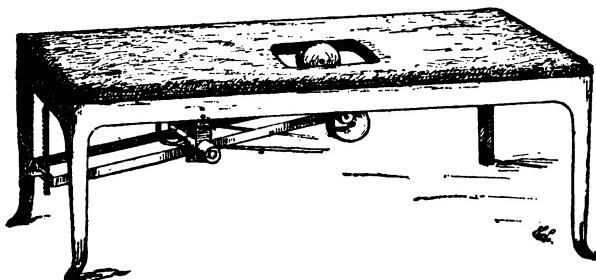


Fig. 3.

At Fig. 3 is shown a form of massage having another specific purpose in view—that of mechanically urging upward and from the pelvis the whole abdominal mass. This action of the rollers, shown in the cut, moving always *from* the pelvis, becomes effective remedially in the following important particulars: The loose, gliding contents of the abdomen are urged *toward* the diaphragm, therefore *from* the pelvis. As these contents are free to move, and practically rest upon the rollers, the upward change of location is mechanically inevitable.

The digestive organs are mechanically continuous through the pelvis, and it follows that the contents of the pelvis participate in the upward replacement.

Another effect remedially indispensable is this. The *muscles* composing the anterior wall of the abdomen are wrought upon by alternations of pressure. This cultivates the natural powers of these important muscles so that they soon react upon the abdominal contents, and participate more deeply in the respiratory rhythm.

The muscular element of the digestive canal is likewise subjected to alternations of pressure which is equally effective for securing its nutrition, and therefore corresponding increase of peristaltic power.

By no means the least in importance is the effect of this form of kneading or mechanical massage on the *fluids* of the abdomen and pelvis. The venous blood of this part of the body has an upward flow opposed both by gravitation and the mechanical obstacles afforded by inertia of the solid portions of the mass. This flow is defective in consequence of the partial absence of ordinary causes of the movement, of which the spontaneous rhythmic motions above described, are the principal. While the massage is restoring

these defects of power, it also by its pressure-motion, assists the onward flow of the contents of the venous vessels. This causes instant relief of the surcharged capillaries of all parts of the abdomen and particularly of the pelvis, where hyperæmia becomes most conspicuous and annoying, as witnessed in piles, and in

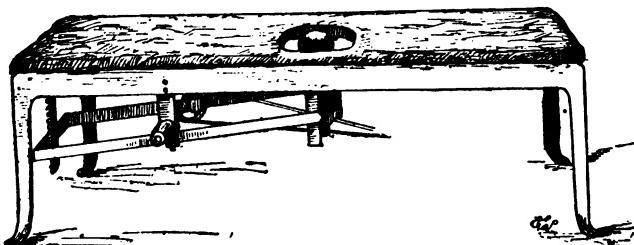


Fig. 4.

all diseases of the contents of the female pelvis. The process described is indispensable for the removal of the *consequences*, whatever form these may assume, of prolonged local excess of blood, especially in the pelvis.

The cut represents a large ball, moving freely on its axis, and rotating in a narrow circle. The patient lies directly over the opening in which the ball rotates, having first adjusted its position as to height to suit his feelings. As the ball both revolves and rotates it gently com-

presses all parts of the abdomen which are exposed to it in succession, at each of its revolutions. The process combines in an agreeable and effective manner the effects on the muscles, the contents of the digestive organs and cavity, and on the circulation of the blood, which are described in connection with previously represented forms of the kneading process.

MECHANICAL MASSAGE, AND THE REQUISITES FOR ITS APPLICATION.

There appears to be a prevalent misconception in the public as well as in the professional mind, in regard to the relations of the manual and mechanical processes of massage to each other. The inference is common that the mechanical methods are imitations of the manual, that they have the same ends in view and produce essentially the same physiological and therapeutic effects; that, in short, the one method is a means of facilitating and perhaps of cheapening the other.

This conception of the relation of the two forms of remedial processes which have acquired similar names, is radically erroneous. The two methods do not in reality cover the same ground. They extend their remedial effects in different directions. So far from being substitutes for, they are helps to each other, both being employed in the remedial treatment of the same individuals, to comply with separate and distinctly differing indications.

The two forms, the manual and mechanical, are similar in the fact that both transmit

motor-energy to single parts of the living body in orderly succession. The similarity ends here, unless it be shown that *rates* of motion, vastly differing, and *amounts* of power or energy which are incomparable, produce the same physical consequences—a proposition contradicted by the most superficial observation everywhere in nature.

The motions of the human hand, like that of a timepiece, are governed by physical laws, which the *will* cannot long control or interfere with. The time during which its expenditure of motor-energy can be sustained is governed by physiological laws, also superior to the will of the operator. The physical, physiological and therapeutic consequences are legitimate objects of study. But knowledge of the facts relating to these topics, supplies no ground for inference as to what consequences would be developed by twenty times the rate, and a practically unlimited amount of motor-energy. The effects flowing from what may be designated *mechanical* rates are, therefore, the legitimate subject for separate study, requiring careful experiment and powers of philosophical observation and deduction.

The reader needs also to be cautioned against conclusions respecting the effects of rapid rates of motor-energy, vibration, or vibratory mo-

tion, as it is often called, based on *local* applications of this agent. The annulling of the sensations, painful and otherwise, which is readily secured by this means in circumscribed areas is a legitimate palliative procedure, but of extremely limited practical utility; and has no significance whatever in constitutional and chronic difficulties, for which mechanical massage has proved successful. The *amount* of motor-energy employed in the local experiments, elsewhere referred to, is too insignificant to be of much actual value.

APPARATUS.

The principal obstacle to a knowledge of the facts, experimental, physical, and remedial, relating to the transmission of the higher rates of motion to the living body, has been the lack of means suitable for acquiring it, although the mechanical requirements are of the simplest description.

It is only necessary to secure firmness of contact of some portion of the trunk or limbs, by a suitable attachment with a mechanical apparatus, and such portion of the body then becomes a mechanical extension of the apparatus. The mode of contact is not confined to a par-

ticular method, but admits of considerable variety. If, under these circumstances, the mechanism be put in reciprocating motion, producing short and very frequent waves, of sufficient rapidity to be of a vibratory nature, such motion continues to travel in and through the limb or trunk just as though it were an unorganized but very elastic substance.

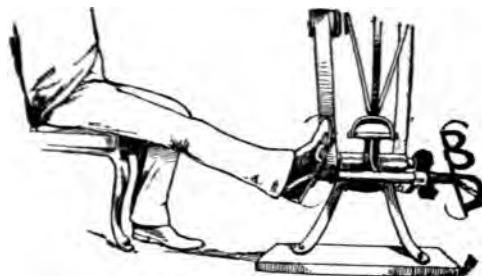


Fig. 5.

The idea presented is readily understood by reference to the cut Fig. 5, which shows the oscillating method of transmitting motor-energy to the limbs. The patient is sitting in easy position, with the limb extended, the foot being placed in a receiver or holder, which simply connects the limb with a horizontal shaft. To this shaft is given very short, quick, partial turns on its axis, which is in line with the axis of the leg.

In appearance, the limb receives a very slight twisting each way, alternately. The actual process is quite different. If a piece of wood were substituted for the limb, it is plain that no effect would be produced because no mechanical change would occur in its interior. If a bundle of fibers be held firmly at one end, and the other, also held firmly, be caused to turn on its axis even but slightly, what will represent interior effects will be rudely produced. The distinct, separate fibers which make up the bundle are compelled to glide upon each other with considerable pressure and therefore friction. The motor-energy conveyed by the hand is gained by the fibers.

If now, the *direction* of the turning motion be reversed, other effects are produced. At the very beginning of the change of direction of the action, the longitudinal fibers which had been made to coalesce under pressure, become completely relaxed and separated, allowing adjacent fluids to fill the interspaces thus caused. As the motion of turning continues, the fibers approach each other, drive out the intervening fluids, and then acquire complete contact as before.

An analysis of the process, therefore, shows that the limb is composed of distinctly separable mechanical constituents; these by the motor

process described, were forced into vigorous contact, with a degree of friction, or gliding of distinct minute parts upon each other with compression, immediately succeeded by the opposite conditions; and that all free intervening fluids, whatever be their nature or quality, are displaced and replaced necessarily by *other* fluids, since the mechanical arrangements of the vital organism conduce to an onward, and oppose all reflux motions of fluids.

Further analysis shows physical consequences of large extent of an entirely different order. A few repetitions of the alternating or oscillating rapid motion, afford a sensation of heat. Examination shows that actual heat has been developed. A part of this heat is easily accounted for. It is the result of the combined friction and pressure to which the mechanical components of the limb have been subjected. Friction with pressure changes motor-energy to heat energy. Another part of the motor-energy transmitted may now be accounted for; it reappears as heat energy.

These effects of transmitted motor-energy, conspicuous as they are, fall into insignificance in comparison with those not directly subject to the test of the senses. As elsewhere shown, the initial function of physiology in each of its departments, consists in the change wrought in

the complex substances received into the organism as food, in reducing it to the form in which it is excluded therefrom. These changes belong to chemical physics. They require oxygen to be brought into actual contact with the changeable substance, at all points, which in-

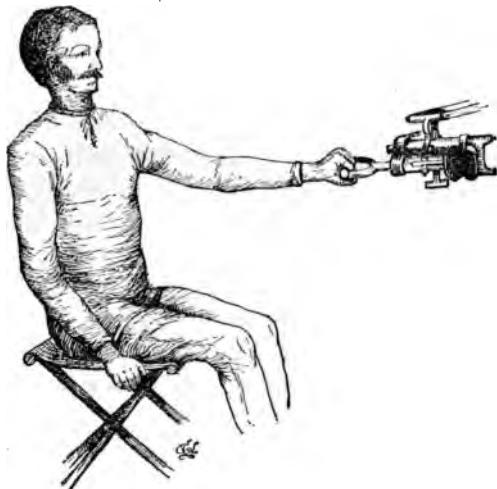


Fig. 6.

cludes the whole organism. This change is normally brought about in all animal existences by motor-energy interiorly developed and expended. In the process described, the same effect is proved to be secured by *imparted* motor-energy, even to a greater degree when

desired than is possible by the spontaneous process. By this process, therefore, oxidable material present in the part readily takes up oxygen and becomes saturated therewith. The amount of intermediary material is diminished, and the unstable and possibly noxious matters



Fig. 7.

present, are reduced to stable and innocuous forms. These acts occurring in due order and in sufficient degree constitute physical health.

The same form of motion is communicable to one or both arms.

In this case, as shown by the cut (see Fig. 6) one hand grasps a handle quite firmly, which is practically like the foot holder, the continuation of the working shaft. The degree of oscillation

is easily increased or diminished by variations of the grasp, the rigid arm and firm grasp causing the motion to extend quite through the arm and to affect the chest. The two hands may alternately grasp the holder, or both may grasp it together as in Fig. 7.

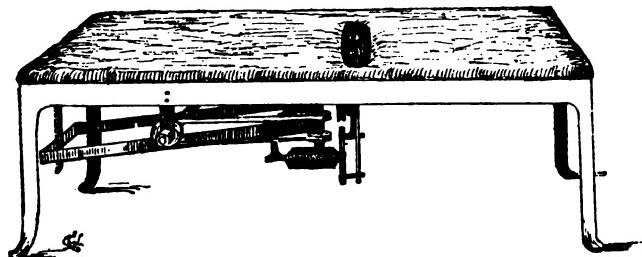


Fig. 8.

In case of the double grasp, a larger proportional amount of the motor-energy communicated by the mechanism is received by the chest.

When a small flat surface is made to impinge upon any portion of the body at rapid rates, the mechanical effect is percussion or *vibration*. This form of transmission of motor-energy causes *waves* to penetrate and even to extend quite through the body, so as to be felt by the hand placed at the opposite side. Fig. 8 shows the apparatus, found after much experi-

ment, to be the simplest and most effective for the purpose.

The patient first adjusts the mechanism so that it will deliver the action to suit his feelings and his requirements, as to degree of force, etc. He then places himself in lying position on the apparatus and exposes any part of the body to the vibratory influence. By simply changing his position, he is able to bring all parts of the body, in succession, in contact with the instrument in action.

The *vibratory* or percussive form of transmitted motor-energy has been that to which previous experimenters have almost exclusively confined their inquiries, and writings on the subject have been limited to observations on the effects flowing from it. But the application of this form has usually been to limited areas of the vital organism, and the amount of power employed in the transmission has been too restricted to afford trustworthy indications of general therapeutic effects, if, indeed, such effects have been sought. The possibility of the latter seems to have escaped attention, while the experimenter was intent on effects manifested by the local sensory nerves.

The consequence of restricted latitude of experimenting has been that the constitutional effects and the special forms into which motor-

energy, penetrating the vital organism becomes resolved, have not only escaped investigation, but even notice.

In the vibratory form of mechanical massage the resistance to the action is at the end of the stroke, at the turning point of the reciprocating excursion of the instrument and not along the line of motion. When the *rate* of motion has risen to a certain point, the consequences of the transfer of motor-energy to the mixed ingredients which constitute the organism are peculiar, marked and unmistakable. Such energy is appropriated in accordance with the chemical nature and aptitude of each of the different ingredients of the heterogeneous mass in which it is arrested, respectively; and becomes the basis of remarkable remedial effects. The scientific problem involved is more fully discussed on subsequent pages.

The methods of transmitting motor-energy to portions of the vital organism above described, appear to have little in common with manual massage, and therefore would hardly be supposed to produce effects resembling those of the manual methods.

The apparatus shown by Fig. 9 presents, however, points of apparent resemblance to the manual process, inasmuch as it transmits combined pressure and motion, which is the more

impressive feature of the manual process. This similarity of appearance has served to confer upon the mechanical process, by common consent, the name of *Rubbing*. The name is, how-



Fig. 9.

ever, a misnomer, if by the term rubbing is indicated friction of the skin, for the action described produces no mechanical effect on the skin. The skin adheres to the clothing and

to the hand by the least pressure; it simply moves with these, and is not traversed, and no friction whatever is produced at the surface. The friction, if it be so called, is entirely between the mechanical ingredients of the fleshy parts, its fibers, membranes, molecular and atomic constituents. It is to these that the motor-energy of the process is transferred.

It will be seen by reference to the cut that the leg is included between two elastic movable pads, to which the mechanism gives quick, short, reciprocating motions. No effect is produced till pressure is applied by the hand of the patient, to a lever within his grasp, then the pads which include the leg, approach each other, with such degree of compression of the flesh as is afforded by the pressure upon the lever. The degree being controlled wholly by the sensations of the person receiving it, is necessarily agreeable to the feelings. The action is subject to instant change, either to greater or less compression by the slightest touch of the hand.

The patient, by moving himself forward and backward on the apparatus, subjects the whole limb from the ends of the feet to the body, successively to its action. Or he may confine its work more particularly to some special region as is often found useful in case of

local mechanical defects of the limbs. The process has a powerful effect in causing *disruption* of local adhesions, which are often the essential parts of deformities. By means of the persevering use of this process, the necessity for *tendonitis* and other surgical procedures, is often obviated.



Fig. 10.

The same process of combined pressure and motion is equally applicable to the arm; and the same apparatus as shown in Fig. 9, may be used for either upper or lower extremity. The delicacy and care with which the *degree* of pressure is controllable, is, perhaps, more clearly represented in its application to the upper ex-

tremity; it is practically the same as respects either extremity. The process may easily include the feet and the hands, and is often of greatest immediate service in restoring heat and blood, and therefore comfort to these remote parts.

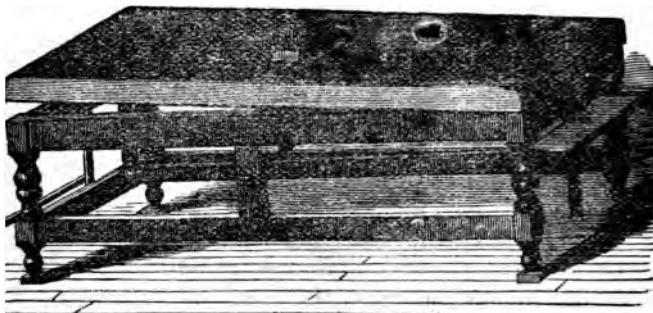


Fig. 11.

Another form of apparatus for transmitting motor-energy to the body equivalent in method and in effect is shown by Fig. 11.

The action is communicated by an elastic pad having a rapid horizontal motion, the rates and extent being similar to the processes previously described. Any portion of the body is easily brought in contact with the pad through an opening in the couch upon which the person rests. The degree of action is

controlled by raising and lowering the pad even while in action. The weight of the body upon it controls the degree of the effects, and this is varied by varying the height of the acting part of the apparatus. The different parts of body may be brought into contact with the instrument by simply turning and otherwise shifting its position. Such shifting of position also regulates in part the degree of the pressure, and therefore the effect.

The attachment which probably lends itself to the most extensive uses, is the V-shaped pad, having a perpendicular action. The V-shaped pad is made of leaves of rubber, and is of course, inflexible to force or resistance applied to the edges, while these leaves readily yield with an elastic spring to lateral force or resistance. The nature of the substance and the mode of construction enables this attachment spontaneously to adjust itself to any shape or size of surface to which it may be applied.

The V-shaped rubber is connected with mechanism permitting a perpendicular range sufficient to reach all parts of the body and of the lower and upper extremities. The position of the body may be changed by turning its different sides to the instrument, so as to

bring any special part that is desired under the action of the pad.



Fig. 12.

The cut shows the mode of applying the perpendicular rubber to the legs. The limb is placed in the angle formed by the leaves of

the pad and its elasticity causes it to embrace the limbs. The pad thus adheres closely to the clothing and skin, and the whole moves together with the flesh against which it is compressed.

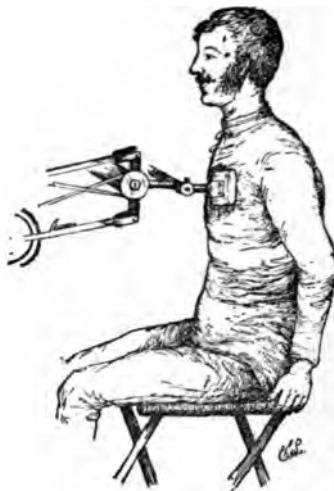


Fig. 13.

Every part of both limbs and of the trunk is easily brought in contact with the instrument while in motion, and the effect depends on the pressure with which the person applies himself to it. The proper amount is regulated by the patient under the guidance of his

sensations. He quickly varies his position to suit his feelings.

The same pad reaches the remainder of the body, including all sides of the trunk and arms in the sitting position.

Fig. 13 shows the position of the body and the mode of applying the V-shaped rubber to the front part of the chest, while Fig. 14 shows the same in a posterior view.

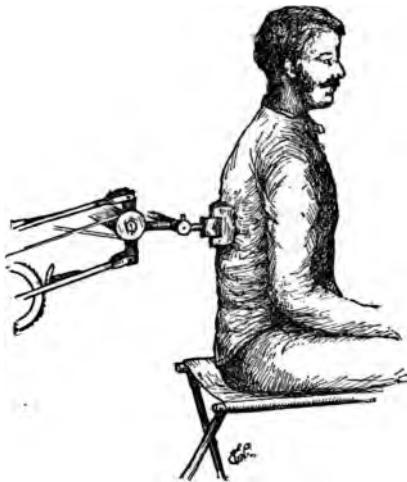


Fig. 14.

This position will also indicate the mode of employing the perpendicular rubber when it is desirable to affect the spine by its action. The

shape of this form of rubber allows it to act with great energy *each side* of the spinal column, while the spinous processes which are between the diverging pads entirely escape its action. Even the deep layers of the muscular mass of this region become profoundly affected by the motor-energy thus administered.

Dress. Contrary to popular notions the effect of each mode of applying motor-energy above described, is entirely uninfluenced by the clothing. The physiological and mechanical effects are the same whether the clothing be abundant, scant, or absent, since the skin escapes its mechanical action.

WHAT BECOMES OF MOTOR-ENERGY RECEIVED BY THE LIVING BODY THROUGH MECHANISM.

The engine, the pump, and machines of similar construction, afford examples of reciprocating motion and its expenditure, and a reference to the different circumstances under which such expenditure occurs will assist in the explanation of the effects produced in the vital organism by mechanical massage.

The *action* in these and all cases of reciprocating motion is clearly divided into two distinct parts. One is the traveling act of the piston and its connections; the other is the turning or end-point, where the direction of the motion is reversed.

In the usual and effective performance of these machines, it is plain that the expenditure of the motor-energy they represent, takes place, wholly, during the linear travel or excursive portion of the act. The piston presses firmly against a column of water and lifts the mass as though it were a solid. The engine turns heavy wheels, through which the motor-energy passes to other work. Or, in case of defective lubrication; the same motor-

energy is expended along the line of travel, a portion being reconverted to heat. In none of this class of examples is there any expenditure at the turning points; there is no *resistance* at these points; the mechanism in its construction carefully avoids that complication; but the resistance is steadily on the line of travel, and the motor-energy of the mechanism is applied to overcome such resistance.

A similar mode of expenditure of motor-energy is illustrated in manual massage. The power of the operator is manifested in pressure and motion; it is consumed or rather appropriated by the fleshy parts of the recipient, during the linear portion of the reciprocating act. And, since the living body includes in its mechanism something like a hydraulic apparatus, the fluids beneath the hand of the operator are displaced and replaced by the motor - energy he contributes, and the parts become refreshed by new supplies of nutritive material. Other portions of the expenditure are converted into heat by the friction caused among the different structures; while the ordinary oxidizing processes are promoted by the renewals of matter due to mechanical causes.

When, however, the piston in the above illustrations is worked *very rapidly*, another consequence appears, and is rendered more pronounced

at every increase of the rate of motion. This is the tendency of the motor-energy employed to expend itself at the *turning* or *end-points* of the action. Nothing is required to insure transfer of motor-energy at the point of reversal of direction of the motion, but some object to receive the energy transmitted, a *resisting* object or substance. The least resistance causes loss of motor-energy on one part, and its gain on the other. This is transfer; for nothing can be lost in the sense of annihilation. The greater the rate of motion, the greater the end-expenditure. The quality of the act now becomes so changed as to receive another name—*percussion*; rapid strokes or blows suddenly resisted.

If the end-points be brought close together, and the distance traveled become very minute, the quality of the act becomes again so altered as to receive still another appellation, and the act is described by the words *vibratory*, and *vibration*.

The force expended in rapid reciprocating motion is received by whatever substance may be present at the end-points, to offer resistance. Such substance may be solid, fluid, simple or complex, stable or unstable. The disposal of the motor-energy acquired at the end-points will in each case depend on the nature of the

receiving object. In any case the motor-energy, instead of being diffused along the line of travel, affording continuous power as in the engine, becomes *concentrated at a point* as by a blow of a hammer. The differences in the effects are equal to those of the action.

Where it is desirable to transform the motor-energy, not by friction into heat and other effects of slow expenditure, but into the concentrated and vigorously active *results* of end - expenditure, it is only necessary to multiply the turning or end-points and diminish proportionally the intervening distance. The motor-energy is now almost wholly converted into *end-effects*, whatever these may be. The act becomes one of vibration and percusion, instead of friction.

The application of motor-energy to the living organism for remedial purposes, renders it highly desirable that scientific distinctions be well understood: for it is only by such understanding that we can be properly guided. We must know what effects are desirable and what are capable of being secured by our remedial agent; and so, how to adapt means to ends. In furtherance of this purpose, additional illustrations of the transformation of motor-energy may profitably be presented.

One of the effects of suddenly arrested motor-

energy may be seen in case of a hard, resisting, homogeneous substance, like soft iron, under the deft blows of a hammer. The atoms of the mass do not differ; they are consequently affected in the same way by the successive degrees of motor-energy they may be made to receive. The new acquisition of energy by the constituent particles of the mass of iron, diminishes their mutual dependence; diminishes their cohesive power; and increases their vibrating power: they tend to separate; the mass softens. The motor-energy of the blows ceases as motor-energy, and becomes heat energy, and cognizable by the nerves of touch. Let the rate of the blows increase and the rate of vibration within the solid mass increases correspondingly; it rises to the degree at which it affects the sense of sight; the iron *glows*. Carry still further the increase of vibration, and yet another consequence is developed. The solid resisting material yields to the influence and becomes liquid like water. The elemental atoms lose their cohesive power. At this point an entirely new class of qualities are acquired. The iron becomes unstable; it manifests affinities for substances in contact, instead of resisting and repelling them, as before. It may again become stable by entering into chemical relations with sulphur, oxygen,

and many other elements; relations wholly due to the increase of the scope of the energy of its constituent atoms, simply through the addition of vibratory motion, the same influence which in more massive form was known as motor-energy, and found to be communicable.

These illustrations are cited for the purpose of showing not only that unlooked for effects constantly appear with every addition of motor-energy to the best known, most homogeneous and simplest of substances, but also the necessity for *actual experiment* to prove what these effects may be. In neither case could the consequences be predicted, in the absence of experiment. The futility is thus shown of prejudging any question of science in the absence of experience, and of experiment so directed as to develop facts, regardless of hypothesis. The lessons of facts like the above, render it extremely improbable that the higher rates of motor-energy communicable by mechanism, will produce effects at all similar to the low and nearly uniform rate to which the human hand is by nature restricted.

Grove proved that motor-energy is transformable to heat in this way. He attached a piece of phosphorus to a wheel, and set it in rapid revolution. When a certain velocity or rate of motion was attained, on suddenly stop-

ping the wheel, the phosphorus ignited. The transformation of motion to heat was direct without the intervention of friction. The critical rate which tends to transform motor to other forms of energy, differs with different substances, and especially with those of complex chemical composition, as will be shown in connection with its effects on the different ingredients of the vital organism, from which remedial effects are derived.

**EFFECTS OF MOTOR-ENERGY TRANSMITTED TO SUBSTANCES
OF COMPLEX CHEMICAL COMPOSITION.**

While all substances suffer radical physical changes when subjected to motor-energy of the high rates, the evidences of such physical changes are far more conspicuous in cases of substances of complex composition having many atomic parts. The rates and degrees of motor-energy for these susceptible objects are far less; only a moderate rate suddenly arrested in a few cases produces wonderful consequences.

These differences of effects of transferred energy must be due to the fact that some of the molecules or particles of compound bodies more readily receive and incorporate motor-

energy, converting it into chemical energy, than other molecules. This difference of facility for arresting and absorbing motor energy, when put to actual test, would immediately change the chemical relations of constituent elements to each other. The attraction of some would be strengthened by the new acquisition, while that of other components would be weakened, neutralized, or changed to repulsion. These differences constitute the intrinsic qualities of elemental atoms, by which it is known that the universe of matter is not a homogeneous substance.

For the purpose of facilitating the understanding of the medical aspect of the subject under consideration, it is important that the facts respecting the greater or less tendency of chemical change under the influence of motor impressions should be recognized and appreciated under some special designation. The terms *stability*, and *instability*, not unknown in expressing the facts of chemistry, may be adopted for this purpose. Substances which suffer chemical changes under slight variation of conditions, may be denominated *unstable*, while substances whose composition remains unaltered under trying physical circumstances, are *stable* and fixed. Between these extremes are all conceivable degrees.

We are now prepared to proceed with illustrations of the effects of motor-energy. If, in the above detailed experiment, a grain of any so-called fulminate, a bit of gun-cotton, or a drop of nitro-glycerine, be substituted for the iron, and receive the suddenly arrested energy of the descending hammer, an explosion of great violence would be produced. The new acquisition of the communicated force affects the atoms of the different elements in varying degrees; the previously existing chemical balance is disturbed; the atoms become rearranged in conformity with the new conditions. In all cases, this rearrangement is simpler in form; the results are less complex, and the atoms are held together in much firmer and more resisting bonds, as though the transmitted energy had become *fixed*, in its new relations. The complex substances subjected to the experiment were exceedingly unstable; under the influence of communicated energy of the motor variety, great stability is acquired. The great manifestation of physical power in the formation of the new products, of chemical change, is owing to the accidental circumstance that a large portion of the more stable products of the change superinduced is gaseous, and therefore occupies manifold

more space; to acquire this space whatever may resist such occupation is violently displaced.

A point of highest interest to our purposes is developed in connection with the illustrations cited. This is that the transmission of energy of *another* form, or of a rate *slightly below* the critical rate, fails to disturb the chemical arrangement of atoms of so unstable a compound as nitro-glycerine. For, it is said, that this substance is capable of ordinary combustion, like that of a candle, if exposed only to the heat of a flame; while the effect of percussion is an explosion of great violence. Examples of this kind show the tendency of suddenly arrested motor-energy to produce chemical effects; and that these effects are in general the resolution of unstable compounds into those of greater and even complete stability.

It is worthy of note in this connection, that the chemical substances mentioned above as typical examples of instability, contain the element *nitrogen*; and are composed of the same elemental ingredients as those of the tissues of the living body; and consequently the same as the substances in various intermediate stages of chemical change which are incident to the nutritive processes.

These components of the animal organism, from the primary form of food, onward to the

last or end-products of the vital processes, are well known to be incapable of preserving their chemical integrity, but are sure to fall spontaneously into more or less rapid disruption of constituent ingredients, whenever the protection afforded by vitality is withdrawn. There is an inherent tendency of all organized bodies containing nitrogen, vital as well as non-vital, to yield to the influences of exterior forces. It is this quality which renders this class of substances fit for vital service; and also for their prompt discharge from the body when not admitted to vital service, as well as when that service is completed.

An essential phase of vital processes, is the chemical changes occurring in the organism; and these changes consist in the transformation of unstable ingredients the organism may contain, to more stable forms. This is effected in ways regulated by the mechanism of the organism; and at rates which obviate undue and unwholesome excess of its unstable ingredients. This is the indispensable condition for health. Indeed, health, in its physical aspect, may be considered as always coexisting with the timely conversion of unstable into stable forms of matter. The acts of conversion and of dismissal are perfectly equivalent.

Experience constantly shows that whenever

the unstable ingredients of the organism exceed certain limits, they are prone to spontaneous changes, they assert their innate energies; these act counter to those of the vital parts which it is their duty to serve; all parts, including those rendered stable by organization and vital protection, become shaken; and the regulative functions of the vital organism, weakened or destroyed. This is disease. A due acquaintance of the above-stated facts is sufficient suggestion as to the general nature of remedies. All true remedies necessarily contribute in some obscure, or, perhaps, understood way, to diminish the unstable and increase the stable ingredients present in the vital organism.

HOW UNSTABLE INGREDIENTS ARE RENDERED STABLE
AND INNOCUOUS.

The point to which the foregoing statements and illustrations converge will now be readily understood. The living body is exceedingly complex, and contains not only substances perfectly unchangeable, but also a large amount of material in various stages of progressive change. It also embodies complete physical arrangements—mechanical and chemical—for rendering its unstable ingredients fixed. This object is secured, as in case of artificial unstable

compounds, through the instrumentality of oxygen—by their oxidation; regulated combustion; reduction to burned products; to such forms of ashes as make constant exit from healthy persons; viz., water, carbonic acid and salines—these being physiologically fixed or stable products, incapable of further change.

The physical provisions embodied in the living organism for destroying and rendering stable the unstable constituents of the body which must otherwise prove noxious, are eminently adapted to this purpose. They consist in *regulated* oxidation, and in this respect differ from the sudden effects described of explosives. In the latter instance, an unlimited amount of oxygen which is hidden in the explosive substance is suddenly liberated, at the same instant that other elements for which it has a violent affinity are also set free. And emphasis is given to the act by the sudden assumption of greater space.

In case of vital beings, the effect is modified by regulative circumstances. Although at the bottom of a limitless ocean of air, the oxygen from it in no case can be introduced more rapidly than called for by organic needs—the demands the system makes for it. Although taken freely by the lungs from the air, it is imbibed by the blood circulating through these

organs, only in proportion as it is received by the general system from this fluid; so that the arterial blood only contains its normal proportion, which cannot be exceeded. And still further to guard and moderate the influence of this element in the vital organism, and to reduce it strictly to the demands made by the actual evolution of the different forms of energy, the *unstable* ingredients of the system are intermingled with and very largely diluted by the *stable* ingredients. This arrangement resembles coals buried in ashes, and in like manner prevents access of oxygen to matters however unstable and oxidable, except under actual contact, secured only by the movement of the particles of matter between which attractive relations may exist. It will further be remembered, that although about the same amount of dry weight of oxygen and of food are employed daily for the purposes of the vital organism, these are introduced separately, by different forms of mechanism, and find their way to solution in the blood by different channels. And though destined to be ultimately dismissed from the body in indestructible union, such union fails to occur, at least to any sensible or recognizable extent, in the absence of the required, the indispensable incentive. Such incentive is the vigorous

contact of molecules and atoms, caused by motion. Elemental matter requires infinitesimal distances for interaction, and this is only secured by movement of atoms into each other's spheres, by other causes than those embodied in the atoms themselves. The organism provides *motion* for this service, as has been previously shown.

DEGREES OF STABILITY.

The reader may still inquire how it is that mechanical massage is specifically remedial in a variety of chronic affections which often greatly differ in location and appearance, and yet proves uninjurious to the vital structures.

The reasons for these selective and innocuous properties of this agent, will be better understood by calling to mind previous statements respecting the nature of the heterogeneous substances which enter into the constitution of the living body.

The *actual* remedial agent is oxygen, whose use, up to the normal extent, is simply super-induced through the intervention of mechanical massage. Oxygen is not a foreign ingredient introduced into the system; it has its natural home in the presence of organized, vitalized

structures of every form. It is thus always practically abundant and always waiting orders for service. Defects of health do not arise from its absence, so much as from lack of conditions for its appropriation. These conditions are supplied by acts of expenditure, incident to health, depending on physical motions. For these, mechanical massage becomes in these respects an effective and reliable substitute, effecting physiological purposes in a physiological way. Only unstable ingredients in the vital organism are exposed to oxidizing influences. Nature provides effective protection against any extension of oxidation to a destructive or even injurious degree. The most delicate vitalized cell-ingredients are partially smothered in perfectly stable unalterable surroundings; through such investures, oxygen is conducted to the vital cells on demand. Such demand is coincident with physical change of place. The vital cell itself is further protected by vital organization. Organic vital molecules do not tolerate change of proportion of their atomic ingredients; such change is destruction.

The chemical activities invited by mechanical massage, contrast strongly in remedial effects with those of medicaments which have been in vogue from time immemorial for the

same purposes. The chlorides of mercury and the iodides may be regarded as types of this class of remedies. The evident *preference* of this class of remedies in exercising chemical power in the vital organism, is for *unstable* ingredients. But everybody knows that their effects are not limited by the instability of the substances with which they come in contact. Highly vitalized portions of the organism are also subject to their destroying power, whereas mechanical massage strengthens the power of the vital elements by supplying the physical conditions for their sustenance. The alterative class of remedies to which reference is above made, produce a contrary effect; they weaken, and if persisted in, subvert the vital organizing power by the chemical antagonism they embody.

The health is continued and preserved by means of alternations of need and supply; of certain organic vicissitudes. It is in this way that unstable ingredients of the vital system, whether occurring spontaneously, or introduced by ignorance, design or accident, are rendered nutritive and useful. Whether a substance proves injurious or useful depends, to a degree, on the intrinsic chemical nature of such substance; but still more on the capacity of the vital organism to *use* it, to convert it to nutri-

tive purposes; or to *cope* with it. The chemical spheres of the physiological activities rise and fall; now they are competent to extinguish poisons; anon the naturally harmless ingredients of food become virulent.

By means of alternations, every organ and part becomes periodically refreshed, and no lurking excess is permitted to gain ascendancy.

Ill health, local and general pathological states are manifestations of uncontrolled forms of energy embodied in nutritive substance, which, being in excess of use, becomes disorderly.

Disease cannot be conceived of as having its source or support in the *stable* contents of the system, vital or non-vital. It has its seeds in residuals—the surplus nutritive matters pervading the organism; these which tend to accumulate in weakened and unprotected organs and locations. Disease is, therefore, subject to whatever urges a proper diffusion of such local accumulation, and develops higher grades of stability in all excess by the natural processes preordained in the physical constitution of the organism.

INDIGESTION.

The never-ending train of miseries included in such terms as indigestion, dyspepsia, and others of like significance, find in mechanical massage their complete, scientific and eminently practical remedy. The *principles* involved by this recourse have the advantage of other remedies, in teaching, at least by implication, the value of the hygiene of air, food, exercise, etc., and therefore include the maintenance and the permanency of health as well as its restoration. Those remedies have little value which teach nothing, and require frequent repetition.

While mechanical massage has no equal among remedies for palliating dyspeptic symptoms, such as local pain in the region of the digestive organs, flatulence, acidity, heaviness, irregularities of the heart, and a host of nervous manifestations, yet its direct objects are the *sources* of these symptoms, the causes of indigestion, rather than its multifarious phenomena. For radical and permanent remedial effects, it is necessary that these sources be well under-

stood. It is hopeless to expect to derive permanent advantages from remedies whose effects are unintelligible. The same errors that produced disease will be repeated, and the same ill effects will continue to follow. The needs of the understanding should be complied with along with those of the morbidly affected senses. But the essential nature of indigestion is not difficult of comprehension, when once the obscurity is cleared away, produced by a cloud of propositions to palliate the variety of symptoms by remedies which have no relation to the sources of such symptoms.

Indigestion, in all its aspects, is plainly the consequence of *unused food* in and about the digestive organs. Aliment has failed of employment; has not been received by the vital organs; not received because not required for functional duties. It suffers spontaneous changes, simply because not participating in those of the physiological order.

Indigestion involves questions respecting the qualities of food to a far less degree than is usually taught—a teaching sometimes palpably injurious. Good food may fail of digestion; food intrinsically bad may become well digested and support well the vital organism. Proofs are too abundant that the dyspeptic invalid may remain dyspeptic, though restricted to

the best qualities of food. Questions of quality, of mode of preparation, of artificial digestion, of digestion enforced by a variety of medicaments—a purpose much and strenuously urged in the medical world—distracts the minds of invalids, but indigestion continues. These questions practically divert attention from the real issue, while the potential factor of the disease continues uninterrupted in spite of the advantages derivable from these sources.

When food remains in the digestive cavity till spontaneous decomposition occurs, the resulting morbid products and their effects on the senses and the general vital powers, are much the same, irrespective of its kind. Even if, primarily, there be no defect in the digestive act, the fact of digestion does not insure nutrition, and the subsequent acts of expenditure, through which only nutritive materials are removable. In this case the excess is returnable to the central organs, usually for excretion by the liver, and perhaps the intestinal surfaces. The main occasion for digestion is to replace losses occasioned by expenditure, and the perfection of its processes naturally depends on those of expenditure and not the reception of nutritive substance. To act on the contrary principle is to seek to invert the order of nature.

Whatever form indigestion may assume, and however the senses and the bodily powers may be connected therewith, its essential factor, that which demands remedy, is want of proper relation between the food taken into the organism, and that actually employed by it for nutritive purposes. Dyspepsia is evidence of unused food. The true, in fact the only remedy, consists in restoring the proper relation between expenditures and supplies. Food must be applied to its uses. The endeavor to digest other food and more food is in no sense remedial, and inevitably defeats itself.

It is here that erroneous conceptions cause errors of practice. It is not the function of the digestive organs to employ food; their function is limited to preparing it. Digestion is simply solution, and leaves the further destiny of food to be controlled by nutritive processes, *subsequent* to digestion. Should any portion of digested material remain unemployed, further digestion inevitably adds further burdens on the embarrassed vital chemistry, already taxed beyond its normal capacity.

No medication of the digestive organs, as such, can increase, diminish, or sensibly affect the functional uses of food by nutritive processes distributed throughout the whole organism. These processes which relate to expendi-

ture are controlled by expenditure and suspended by suspense of expenditure, whether the digestive act is going on or not. No supply to the acting tissues is possible in the absence of accompanying or preceding expenditure, simply because nutritive support in that case is uncalled for, and unnecessary. Nutritive supplies become, under these circumstances, not a boon but an embarrassing superfluity, easily degenerating into injuries.

From these considerations, it follows that the practical effect of remedies addressed to the digestive organs, is less that of assisting the function than that of blunting the local sensations, and of diverting the mind from the real and potential factor, which is that of the uses the organism is making of the nutritive supplies. This factor is far from being reached by digestive action or digestive remedies, however agreeably these may affect the consciousness. Medical deception is easily wrought through the senses which may imperil the whole vital fabric.

The rate of digestion is necessarily controlled by uses, service or employment of digested products, and expressed by the various channels of expenditure. It is proportioned to the effectiveness of physiological processes upon which digestion waits. The consequences of the most

strenuous endeavors to increase and promote digestion, are strictly limited by the law of equivalence of digestion and expenditure. Indigestion is compromise of the law. Just so much food will pass through the successive stages of the physiological career as is dismissed from the organism through manifestations of vital energy. More, is impossible, vitally, physiologically, and mechanically. Indigestion indicates imperfect results; the embarrassment of the career of nutritive substance is placed at the entrance, serving rather to protect the remainder of the series of physiological processes from what must be prejudicial. In this sense, indigestion is conservative and relatively wholesome.

The faculty possessed by the organisms of most animals, and a few of the human species, to form *fat* from the surplus of digested food, affords neither an exception nor a compromise of the above statements of physiological principles. Fat remains unused food; it is material which has not yet served its purpose; it has supported no expenditure, has represented no energy, and cannot therefore increase the average capacity of the vital organism to receive or expend nutritive supplies. Fat represents digested food transformed to a more stable form, a wonderful power of the vital

organism to obviate any immediate damage to itself from the inviolable law of equivalence of expenditures and supplies.

• The rational as well as practicable way of remedying indigestion is clearly pointed out by the light of the knowledge of its causes. In this light, the subjective phenomena become of comparatively little account, in place of main account. They cease with the avoidance or withdrawal of their causes. The local pain, the acidity, heart-burnings and throbings, the irritability of mind and sense, are *not* the main object of remedies, and may be practically neglected without in the least compromising the result or prolonging its attainment.

Mechanical massage (with the supporting conditions before mentioned) is a true and unequivocal remedy for indigestion and for its connected ills. It applies to the potential source of the morbid manifestations, and this prevents their occurrence. This source is demonstrably the uncompleted products arising from the vital chemistry in the organism at large. Mechanical massage serves to perfect and complete the uses the system makes of food. It carries forward to the normal and ultimate stage the oxidizing function of the vital organism. This purpose is secured, both as regards the vital, acting constituents of the organism, and the fluids in

which these are bathed, and on which the organized parts depend.

Mechanical massage, therefore, speedily destroys (by oxidation) those *unstable ingredients* whose existence is rendered patent by the morbid phenomena called indigestion. For it is not the stable, but the unstable ingredients which give rise to acidity, flatulence, irritability, biliaryness, and other local, morbid symptoms, whether arising from decomposing food which has never left the digestive cavity, or from that digested, but returned to the digestive centers because not taken up for normal uses. Oxidation prevents the return of these to vex the secreting organs and to pervert its function into that of being excretory.

The curative effects of this form of massage are most satisfactory, because in the natural physical order of events, the most unstable of the offending ingredients are soonest amenable to the increased supply of chemical energy. The most noxious speedily become innocuous products of normal, healthy waste; the same as results from normal expenditures. These wholesome effects have little reference to the original qualities of food.

Indigestion causes muscles and other tissues ultimately to *shrink*. They gradually lose their power of transforming, that is, using food. This

is the reason indigestion is not self-curative in its nature, and is not curable by dietetics alone. No kind or quality, or form of dietary is capable of compelling the muscles to act, and to transform food, so it can pass from the system as stable, innocuous products of waste. Feeding muscles is illusory, in the absence of *using* the muscles.

It follows that the results of prolonged indigestion are removable only by some form of *cultivation* of the muscles, the principal transforming agents of the organism. Such cultivation must be systematic, and continued long enough to raise the chemical function of the organism to the normal standard. No other form of remedy is appropriate or even rational, however lauded from the merely palliative point of view. While muscles in health may and do assimilate during rest and sleep, this power is reduced to the lowest effects by prolonged indigestion, and will certainly fail to do so to any adequate or restorative degree, unless incited by expenditure, which must, in this case, be largely involuntary, such as is produced by massage.

The cure of indigestion and its manifold attendant ills on the principles above pointed out is of inestimable educational value. The sufferer becomes convinced, by experience, of

many popular errors which are grave stumbling blocks in regaining lost health of the digestive organs. He learns that his affliction arises primarily from disparity between the uses and the supply of food; that the amount digested depends less on the digestive organs than on the demand of the acting tissues; that improving the quality of food is not necessarily remedial, since it has but little relation to the services to be performed—the current expenditures; that ready digested and easily digested food are the abomination of dietetics; they prevent normal incitation of the digestive organs, necessary for normal secretions; and are liable to cause unnatural, irregular, unmanageable increase of the unstable ingredients of the organism, which react injuriously upon the digestive secretions, especially those of the liver; they encourage the false doctrine that nutrition can be assured without reference to expenditure or of providing any use for nutritive material. The prevalent recourse to these presumably enforced methods of nutrition are, in short, a violent and abnormal reaction against the former prevalent reign of physic, depletents, and so-called alteratives. These old methods actually provide modes of disposing of nutritive unused supplies, although they be *morbid modes*.

DISORDERS OF THE NERVOUS SYSTEM;
NEURALGIA, ETC.

Notwithstanding its limited scope as regards amount of pressure and rate of action, manual massage has from time immemorial been held to be of eminent service for quieting the disorderly nerves, at least temporarily. It is instinctively used to soothe nervous irritability and palliate the various aches to which the oversensitive are liable. This remedial agent has thus been long and well proved to be serviceable in such phases of nervous disorder as sleeplessness, general and local neuralgia, hysteria, etc.

Mechanical massage having immeasurably greater scope both in amount and degree of its effects, proves in practice to be correspondingly more efficacious in diseases of a nervous character. This agent requires proportionally greater skill in its administration, in order to secure the remedial effects it is amply capable of affording. The local and general peculiarities of the case, the constitutional peculiarities of the patient, and the actual source of the local suffering must be well understood. Dis-

orderly, haphazard applications of mechanical massage, placing undue reliance on the general power of the agent rather than the special and orderly mode of its administration, is liable to be highly injurious, rather than remedial. This is because increase of functional activity may be superinduced in parts where it needs to be diminished, and diminished in parts where its increase is desirable. Success, in other words, depends on an accurate practical familiarity by the physician with the pathology, and an equal familiarity with the powers and peculiarities of the remedial agent he is dealing with.

It is also to be considered that diseases of the nervous system are the opprobrium of modern medicine, and that many of the applicants for relief have long ago exhausted the resources of physicians and of current medical knowledge in vain. These require for their proper management the gentlest care and the highest and most scientific appreciation of their remedial needs. Such are the problems with which mechanical massage has generally to deal.

An encouraging foretaste of the remedial power of mechanical massage is experienced even at the commencement of a course of treatment. It commends itself in the strongest manner to the feelings. Not unfrequently at the first applica-

tion, a peculiar sense of relief steals over the patient, the local pain diminishes, and if the surroundings are favorable, the patient not unfrequently falls into a quiet sleep. These are indications of diminished nervous irritability, and therefore of an approximation to the natural standard of functional activity. This curative indication increases day by day with the progress of the treatment.

Excellent results in nervous cases are often secured by massage, even in spite of unfavorable conditions, showing not only the appropriateness, but also the searching and radical nature of the remedy. Examples of this kind are found in the cure of "writer's cramp," so called, which often afflicts accountants and artists, without even requiring suspension of avocations, the too intense and uninterrupted pursuit of which had been the cause of the difficulty.

Even for that numerous class of nervous invalids whose constant dependence on sedative drugs announces too plainly their abandonment of hope, the remedial agent here presented offers a real boon. The hopes of this class revive from the start, because they not only experience the beneficial effects, but also are soon able to understand the practical as well as the philosophical connection between the remedy

and the affection for which it is applied. This they were unable to do in case of the palliative measures with which they were heretofore compelled to be content. Under the new circumstances, these patients soon discover that the general effect of *dosing* for pain, ill-feeling, or excited sensibilities, is wrong in principle, has a large contingent of deception, and, if prolonged, is sure to work disaster. It conceals or postpones the evidence without correcting the fault; it affords apparent relief, but actual injury; increasing and not diminishing the aggregate suffering. The remedial agent now advocated, on the other hand, serves a contrary purpose; it corrects the quality of the nervous power at its nutritive sources, and so apportions the distribution of the supporting material between the instruments of vital power that their relations to each other will be natural and healthy.

The mistakes and failures of treatment which appear to be the rule as respects nervous affections, doubtless have their cause in an incorrect conception of the intrinsic nature—the pathology—of these diseases. On this point mechanical massage throws a flood of light unattainable through other channels. It shows that the perverted nutrition which modifies and deteriorates the quality of nervous power is a

thing distinct from the consciousness. One is cause, the other effect. To merge the two considerations as a unit, and that unit the consciousness, leads directly to improper treatment; for in this case whatever appeases the feelings and diminishes the discomfort, becomes the remedy. Now, the medical art supplies unnumbered ways of inhibiting or suspending manifestations of nervous power, without materially affecting, certainly without removing the cause of ill-feeling, or in the least rectifying the nutritive faults which are its source.

Another consideration is entitled to more weight than is usually given it by either patient or physician. The feelings, sensations, and even pain, have an important conservative function, which should not be too freely tampered with by means which of themselves are well known to pervert the action of their source. Pain is the trustworthy evidence of the morbid action at its source; and to cast this evidence ruthlessly aside as of no value, indicates poverty of medical ideas as well as resources. The obviously proper way to treat pain of a chronic or neuralgic character, and, indeed, all irregularities of the sensory powers, is to obviate the causes to which such manifestations point.

Into what a sorry plight would animated ex-

istence at once fall if only the *intention* of a large part of medical practice were attained; or if immunity from pain were natural! Such immunity abolishes the distinction between discretion and indiscretion, and all creatures would at once fall victims to the consequences of the omission of the gift of pain.

Massage, especially mechanical massage, and the remedial adjuvants naturally associated therewith, afford a new experience, and thereby an additional and most instructive chapter of physiological and medical facts. These resolve the difficulties arising from confounding pain with its causes. The nature of the perversion which is the source of suffering is demonstrated. The actual condition is excess of nutritive activity of nerve tissue over that of the muscular tissues, and an incorrect distribution of nutritive material in obedience to the unbalanced demands thus created. Circumstances, usually controllable, have compelled vital manifestations and vital expenditures to pursue wrong channels. The remedy therefore consists in *redirecting* the flow of vital energies.

The habitual nutritive activities which are the sole source of the common energies of the vital organism, having become excessive in certain nerve centers, or in the general nervous mechanism, are correspondingly diminished in the

muscular channel of vital power. The excess of the one requires to be turned to the account of the other; or, what is equivalent and entirely practical, the nutrition of the muscular system, which in this class of cases is invariably feeble, requires to be incited by legitimate means for the purpose of diminishing the morbid irritability of the nerves. Nerve nutrition is necessarily proportionate to the expression of nervous power or energy, just as muscular nutrition is proportionate to muscular power. The excited nerves, whether manifesting agreeable or disagreeable feelings, imply corresponding excess of nutritive activity and support of both centers and conductors, which in the class of cases under consideration is unbalanced and without automatic control. The natural and healthy control of nerve nutrition and action lies in the *counterpoising* action and restriction of the muscular system, and *only* in such action, practically admitting of no substitute. The correctness of this view of the pathology of disordered nerves is amply confirmed in practice, although quite opposed to the ordinary conception and practice in this class of cases.

The comparatively new word *Neurasthenia*, lavishly used nowadays, for explaining the nature and requirements of nervous diseases, has

served greatly to propagate and confirm the errors in medical treatment above noted. Without stopping to discuss the false pathology this term teaches, it practically encourages the employment of remedies whose sole effect is limited to the nervous system. Remedies of this class produce their special effects through the increased nutrition of nerve centers and conductors. They sometimes directly, in other cases indirectly, promote the nervous irritability, and therefore the nutritive action which is demanded to support such irritability. Such medication practically wrests nutritive support *from* the muscles which need it, and applies it to the use of the nerves, whose manifestations, and therefore whose nutritive support, are already in excess. The ultimate consequences are necessarily quite the reverse of therapeutical; for the nutritive and therefore the morbid supremacy of the nervous system is promoted and not diminished, while the contrary effect is superinduced in the muscles; parts which, in health, serve as the necessary and absolute counterpoise of the nerves. The therapeutics implied by the term is therefore unphilosophical, bordering on absurdity.

OTHER EXPERIMENTS

One of the effects obtainable from mechanical massage is anesthesia, or temporary diminution and even abolition of local sensations. With this effect the medical profession has become somewhat acquainted through Dr. J. Mortimer Granville's book, and through contributions to current medical literature, chiefly English.

The experiments which have afforded the evidence of this peculiar effect of mechanical massage have been restricted to the vibratory form of the application; or what in preceding pages has been distinguished as the end-expenditure of motor-energy. They have also been limited to circumscribed areas, usually including only the locality of the pain, and the immediate surroundings. These experiments, showing that motor-energy even in a limited amount is capable of abolishing pain of a neuralgic character, have proved thus far to be of limited service in practice, and the applications have been restricted to that use.

Justice to the present author seems to demand a few words of comment and of explanation respecting the claims arising from this development of mechanical massage, and these may be ranged under the following heads:

As to Originality. The earliest recorded experiments in this line of inquiry were, so far as known, published by the author in several medical journals. These were, some years afterward, collected, and the substance published in book form in 1871, entitled, *Remedial Effects of Vibratory Motion in Paralysis and Affections of the Nerves*. This latter publication antedated, by some years, anything known by the author to have been published on the subject.

As to Scope. The experiments above referred to were almost wholly confined to weak vibrations and those of comparatively short duration, as those caused by a tuning-fork, or the gentle tapping of the fingers, or instrumental substitute worked by the hand, or some simple mechanism of limited power. In each case the source of power is limited; and the effects of longer continued applications, of higher rates of vibration, of the transmission of a large amount of motor-energy, and of the constitutional effects arising therefrom were unnoticed, and were, from the nature of the sources of the vibratory action, practically excluded from inquiry.

As to Remedial Effects. Observations made under the restrictions above noted have naturally been to a degree *misleading*. The atten-

tion of the observers was drawn toward and concentrated on the curious phenomena of anesthesia, and the desire to account for it drew out theories as novel as the thing observed, but unsupported by sufficient array of facts. The hypothesis which has gained most favor is something like this: Nerve conduction consists of wave-like motions, and these waves are obliterated by similar waves, the elevations of one set filling the depressions of the other—and no waves, and therefore no sensations, result.

This hypothesis, while an important therapeutic fact is admitted, is singularly wanting in proofs. How do we know that nerve-energy is transmitted in waves, or that these have any correspondence to, or capability of coalescence with those of the irregular and arbitrary forms produced by mechanical means?

The above-mentioned hypothesis entirely ignores the facts and principles developed in preceding portions of this work. Among these may be enumerated, the transformation of motor to chemical energy; the peculiarities of end-energy of transmitted motor power; the chemical consequences in the nutritive fluids; the degrees of stability of the contents of the vital organism; the control of nutrition of the muscles, and the relations of this fact to nervous

power, normal and morbid, etc. The discussion of the subject in medical journals has been nearly dropped, evidently in consequence of the paucity of the facts brought out by such experimentation as that above referred to.

In resuming, it may be said mechanical massage affords something like a rational and scientific, as distinguished from the empirical view of nervous affections. This advance has gained strength through the demonstration its methods afford that muscular power and nervous power are indissolubly connected in disease as in health with *nerve nutrition*—with physiological changes of the vital substance from which nerve energy proceeds. The reader should be cautioned by the statement that nutrition is not necessarily implied by the fact of ingesting and digesting food; or even by ingesting those kinds of preparations of food that are supposed to be preferred by the vital nerve-cells to replenish their waste. *Nerve nutrition is inseparable from the expenditure of nerve power, which invites and controls it.* Special nerve food, if there be such food, inevitably remains unemployed till called for by nervous acts, but cannot inspire those acts, and therefore is incapable of transforming morbid into healthy innervation. The incitation and the repression of nervous action by means of medica-

ments, do not help over this physiological difficulty. These have little or nothing to do with muscular forms of energy, and are therefore incapable of supplying the thing wanting.

The grave practical error of the therapeutics of nervous disorders, is that of making the sensations, feelings, and emotions, the practical test of therapeutic needs, and of diagnosis, when in fact some of the most serious embarrassments to the health greatly antedate and are seldom parallel with sensory indications.

HOW MECHANICAL MASSAGE CORRECTS FAULTY MANIFESTATIONS OF NERVOUS POWER.

It does not require a professional or a scientific training to understand how mechanical massage is remedial for nervous disorders, and how the remedial effects may extend even to formidable organic sources of nervous disease. The traditions of medicine are indeed obstructive in this inquiry since they lead from the main purpose. They deal with consequences rather than causes. The true problem is to reach the sources of vital energy in a proper manner. Mechanical massage accomplishes its remedial purposes in relation to the nerves in two principal ways.

The *first* consists of what, for want of a bet-

ter term, may be called *functional revulsion*, the turning of nutritive activity from one function to another and different function, so that the one shall diminish and the other increase, in those acts or processes whereby energy is evolved. By changing the mode of action the seat of action is also changed.

The phrase *functional revulsion* recognizes a common source of the energies of the vital system in the food: the sort of power food yields depends on how and in what class of tissue its latent force is liberated.

Now, the expenditures of energy to support which nutritive material is supplied, pursue two principal channels: that of the muscles on the one hand and the nerves on the other. The harmony of action which constitutes health arises from due proportion in the action, and therefore of the nutritive support of the instruments or channels of power.

In health, muscular acts are due to nervous incitation; either from the will or involuntary sources. This physiological fact insures a proportionate and correct distribution of nutritive support; it includes taking material from the blood, and incorporating it in nerve tissues and muscular tissues respectively. The ratio of action and of expenditure of the nerves and the muscles is physiologically equal and balanced.

In ill health, the case is different—these relations and this ratio are changed. Physical and chemico-physical causes intervene, producing nervous incitation unrelated to the physiological needs. So much of this cause as affects the consciousness is pain, which is nothing less than energy reacting upon its nutritive source. Mental and emotional causes similarly induce a high degree of nervous activity, compelling increase of nutrition of the source of these forms of power, and consequently increased demand by nerve tissues upon the common sources of supply. These circumstances, when temporary, simply suspend muscular nutrition, which is resumed when the cause abates. No one can possess or manifest any considerable muscular power when in pain, even with a toothache.

When, however, the unequal ratio between the uses of nutrition by the nerves and the muscles is prolonged, the disparity tends to become fixed—a physiological habit of disproportion in the division of nutritive support between the two great instruments of vital energy or power is superinduced. The nerves secure too much, the muscles too little; unregulated and superfluous nervous action, pain, neuralgia, excess of the emotional nature, insomnia, and muscular insufficiency are the consequences. This morbid functional condition has no ten-

dency to self-correction. And the prevailing misconception of its nature and sources almost invariably favors its perpetuity by misapplied remedies.

Now the true antidote to this condition is readily suggested by common sense, if the latter could only become untrammeled by medical traditions, without scientific foundation. To incite muscular demand for nutritive support is to diminish the supplies morbidly applied to nervous uses. The surplus of nutritive materials is thus turned *from* nerve centers and nerve conductors, in response to more urgent demands of the muscles; and the evolution of morbid excesses of nerve energy in the form of pain, etc., necessarily diminishes, and ceases permanently.

When the physiological fact that nerve substances, whether in masses, as the brain and spinal cord, or diffused, as in case of ganglions of the visceral organs, have no control of their own circulation, is fully considered, the reasonableness of the above statements must be admitted. The co-operation of muscles is absolutely necessary to effect the return of the circulation from nervous parts. This return of waste and of surplus material of nutrition of nerve substance cannot be secured by medication whose effects are limited chiefly to nervous tissues, spite of the endeavors and theories of modern med-

icine. The physiological mechanism forbids it.

Massage, especially mechanical massage, incites nutrition of muscular substance in the highest degree. It does this in perfect conformity with the natural requirements of muscular tissues, the difference being in degree. The same agent, when intelligently applied, with this purpose in view, produces no effect whatever in nerve tissues, least of all, incitation of nerve nutrition. The act of massage traverses no sensory or reflex nerve, and the centers remain unaffected by it. This is fully shown in the author's work on "Manual Massage." The muscle nutrition superinduced by massage is, therefore, independent of nervous influence, nervous action, and nerve nutrition.

The nutritive consequences are therefore of the highest import from the therapeutic point of view. Muscular nutrition is carried in excess of the usual habits of the muscles, and nerve nutrition is in abeyance. The distribution of the blood to these parts respectively is proportional to its uses. The result is *physiological revulsion*, in which muscles gain activity and function, while the nerve centers simply lose their morbid excess of nutrition and function. The two functional activities are harmonized.

Pain, neuralgia, and all aberrations of nervous function, permanently cease.

This curative result differs from the medicinal effects in these important particulars. The general effect of neuralgic remedies appears to be that of *inhibition* or repression of activity, and therefore of the nutrition of the nerve substance, and of its flow of energy corresponding to the suppression of pain. But no counterpoise or other use of nutrition is provided. The elapse of a short period of time removes the repressing agent in the natural or physiological manner, and the previous condition reappears, unless, perchance, other and more favorable circumstances have intervened. The incitation of other nutritive acts, demanded for permanent restoration of harmony, is quite beyond the province of medicinal remedies, when the case has become chronic.

The *second* specially remedial purpose of mechanical massage is as radical as the first, and as incapable of being complied with by substitutes; at least to any adequate degree or permanent extent. This is the power of mechanical massage to destroy excess of unstable ingredients of noxious quality in the physiological system.

All physiology and all pathology agree in the fact that noxious ingredients may pervade

the vital organism. It is only necessary to carefully observe the effects of poisonous doses of common drugs, as of opium, for example, to be satisfied not only of the fact, but also the further fact of subsidence of the effects with the removal of the drug by means of the ordinary chemical physics of the vital system. The oxidizing function only requires suitable time, and the removal of the offending substance is quietly effected, and the consequences cease, provided only that the inhibition of important functions has not been too great or long continued. The same statements apply to all noxious substances, and the removal is in the ratio of chemical instability of each, respectively.

The vital system is an arena for chemical processes, the details of which are intelligible by the results. When the morbid products, made evident by their effects, are sufficiently stable to allow of isolation, as, for example, the rheumatic poison, we have a glimpse of the chemical history of the products. If such products are *unstable* in quality, we only know the passing morbid phenomena; the deviations of nerve energy from its true line of manifestation.

The presumption that unstable products of imperfectly elaborated waste are capable of

producing specific modification of nerve nutrition, and therefore of the quality of nervous manifestations, is justified by the analogy above cited of the action of drugs. Although like the artificial nerve incitant or depressant, the spontaneous one is continually removed by the vital chemistry, yet the imperfect degree of its processes allows its constant reproduction.

It must be remembered that the nerve centers and conductors are literally bathed in the general fluids of the body, and that their nutrition, and the removal of their waste depends on these fluids. Chronic irregularity of nervous manifestations is practical evidence of the existence and the influence of such specific unstable substances, and that these pervade the organism.

The readiness with which the nutritive fluids are improved in quality by mechanical massage has been shown on preceding pages. The unstable ingredients, which are always sub-oxides, are destroyed in the order of their degrees of instability, while the chemical function of the vital organism is gradually raised to the normal point.

The influence of this agent in restoring the nerves whose nutrition, and the quality of whose manifestations have become deteriorated,

will now be readily understood. For whatever the chemical composition of the offending, perhaps somewhat poisonous ingredient may be, *one* of its qualities is easily proved—the quality of greatest practical interest to the sufferer. This is its *instability* under the influence of mechanical massage. The more pronounced symptoms of nervous irregularity and excitability often diminish even during the first few applications of this remedy.

The reason becomes at once obvious to those who have attended to the preceding statements. Physiological oxidation is carried forward to the completed degree; and the offending sub-oxides, being unstable, are destroyed, exactly as in health. These offending, fugitive substances, however annoying to the vital powers and processes of the nerve tissues, are perfectly subject to the control of the vital chemistry, when once this is empowered to act with its natural degree of intensity. The process is nothing more than the ordinary process of elimination, and this is the highest purpose of all legitimate medical aims.

The process and the effect described are unique in these respects. No drug is capable of similar effects; indeed, other effects are expected and sought. No drug can be equally specific, for none is known to have special selective

power of removing noxious sub-oxides. No drug is capable of affording continuous and trustworthy relief, in any degree comparable with the natural processes exalted in degree by mechanical massage; for drugs are eliminable by the same vital chemistry that opposes unstable sub-oxides.

THE REST CURE.

The invalid reader is cautioned against too readily inferring that a method of rest, lying in bed, daily manual massage, occasional use of electricity, baths, and prescriptions of sedative drugs, now much favored by physicians, represents principles of practice equivalent to those set forth in preceding pages.

This remedial course fails in the following important particulars:

The mode of rest prescribed is that of lying covered in bed. Under these circumstances the loss of heat by the body is reduced to the least amount possible. It follows that the heat producing function is reduced proportionally, for the heat production is in the ratio of the incentive, which is the expenditure. The muscle cells are the great heat producers of the vital organism. The motor power of the muscles is

equally discouraged. It is an accepted principle of physiology that the full heat making capacity is the necessary concomitant of the power of both muscles and nerves. This plan also represses oxidation and the discharge of waste in the completed or end-forms of carbonic and water.

To counteract the unfavorable effects necessarily resulting from extreme repression of vital powers in general, in order to secure repression of its annoying manifestation through the nerves, manual massage is employed. But manual massage, however thorough, is ridiculously insufficient for the purpose. An invalid of the class liable to employ the treatment described, may receive with advantage many times the amount of massage any strong person can supply. The operator's power is exhausted before the point of benefit is properly reached.

Manual massage is beside quite capable of damaging, in place of benefiting, the nervous invalid. This depends on the intelligence of the operator and the manner of its application. If so applied as to increase the sense-power, which includes pain and the undue manifestation of the emotions, the patient is not benefited, but quite the contrary result follows. The author has repeatedly witnessed these adverse consequences of the rest cure with massage.

Another ill consequence of the repression of heat and of muscular action and the repression of nutritive acts corresponding with them, is the necessity involved of greatly restricted respiration. The incentive to respiratory acts is repressed with diminished heat and muscular power. This allows the accumulation of transformed food, in the form of fat. The protection of the organism against excess of unstable sub-oxides in this way, is probable only in a comparatively few cases; in the remaining cases the excess is tolerably sure to assume some aggressive form.

Experience justifies the cautions usually given to very weak invalids as to the extent of their ordinary exercises. Such invalids are extremely liable to be set back in their progress toward health, even by slight exertion. Many physicians try to avoid such occurrences and discouragements by insisting on extreme caution, or prohibition; which of course tends to prevent the acquisition of the needed strength.

The physiological principle involved in the guidance of invalids in this respect appears to be practically misunderstood. No discrimination is made between the effects of voluntary exercises under different circumstances of health.

The trouble arises from the fact that very

weak and ill nourished muscles do not respond sufficiently to ordinary impressions of the will. They require extraordinary impressions. Therein lies the important feature of their incapacity. More incentive, that is to say, a larger amount of will-power for more exertion, is required to overcome equal obstacles when the motor agent is insufficient. "A dull tool requires the more strength." But exertion is *will* and *nerve* exercise; and under these circumstances the nerves demand a larger supply of nutritive support than the muscles at the same time, call for, or are even capable of receiving. The result of effort under such circumstances is to overwhelm the nerve centers and to starve the muscle cells, by the mal-distribution thus superinduced. What is required for restoration is exactly the reverse of the effects of exercise; but this requirement is not in the least fulfilled by prohibition and avoidance of exercise. As before explained, it is the omission of the will power, of effort and participation of the nerves, to the extraordinary degree required by exercise, and *not* avoidance of muscular action that is demanded for restoration of their powers. The muscles do not suffer fatigue or even discomfort from activity, even in extreme degree, as is abundantly proved by massage; but only the nerves and nerve centers connected with the muscles; and

then only in case of disparity between *their* action and its nutritive consequences, and that of the muscles to which they supply the incentive. A little knowledge of the practical workings of massage corrects the errors of inexperience, and the incorrect inferences due to partial knowledge, above referred to.

PARALYSIS.

The loss of nervous power and its influence, even though painless and of limited extent, is a formidable affection because of its evil augury. Experience cautions sufferers to expect even greater restrictions of power. Medical science supplies no unequivocal promise of preventing it, and no sure way of remedying loss of nervous power, whatever part may suffer. But this fact often produces an effect contrary to the interests of those who are threatened with, or have actually suffered paralytic loss of power. For the intractable nature of paralytic disease should prompt those threatened to acquire knowledge leading to the avoidance of its causes; and after the infliction, to such measures as are truly remedial, instead of wasting their time and strength in trials of unlimited number of drugs, whose effects have not the faintest relation to the potential sources of the disease. The need of the paralytic is *not* to be led in a useless and wasteful struggle against certain outward effects and symptoms, but an intelligent comprehension of the nature of the sources of the disease, of what causes suspension

of nerve power, so that being understood, remedies may be properly directed.

The unprofessional reader may be surprised to learn that the *causes* of suspension of nerve influence, that is, paralysis, arise in many, probably most cases, *exterior to* the nerves. The nerve centers suffer in consequence of defect of other than the nervous function. Great abuse of the nervous system may cause great suffering, irritability, and derangement, but the destruction of nervous power requires the co-operation of additional causes.

As the remedying of paralytic affections is intimately connected with their sources, some of these may here be referred to.

A blood-clot, possibly minute in size, formed perhaps in the heart or larger arterial vessel, floats onward under the impulse derived from the heart, till, reaching some subdivision of the vessel which causes restriction of caliber, becomes there lodged, forming an impassable barrier to the further entrance of blood to the portion of brain supplied through that channel. Neither nutritive substance nor oxygen, on which the vital activity of the part depends, is supplied. The manifestation of power necessarily ceases, and the nerve filaments extending from the affected area cease to possess functional influence. The portions of the body

supplied by the nerves emanating therefrom are paralyzed.

Now, as each portion of the brain and of the spinal cord has a different function, that of one part being motion, of another, sensation, it is plain that the consciousness of the nature of the impairment as relates to these functions may be tolerably good; but there is generally no consciousness of the special location of the seat of the trouble. It is more apt to be referred to the parts where the symptoms appear, than to their remote source.

But even in this case, the potential affection is not the loss of power; this is secondary. The cause of the blood-clot is the positive factor, and an important one from the remedial point of view. This, the patient should understand something about, for it is this, which remedial treatment has to contend with. It is clear, even to the non-medical understanding, that the disease is one primarily neither of the muscles nor of the nerves; and therefore that remedies addressed to, or affecting these exclusively, may have little or no relation to the actual needs of the sufferer. It is equally plain that the vital qualities of the blood have become lowered, and that any and all circum-

stances conduced to such defect are the real source of the disease.

In the same sections of the body, the interior of the blood-vessels is liable to disease. Progressively these conduits become less capable of retaining their contents, and the more fluid portions transude into the surrounding nervous structures. The mechanical compression thus caused partially or wholly prevents the normal evolution of the nerve power which emanates from the affected region.

Then follows suspension, more or less complete, of the powers of sensation and of motion in the parts to which the nerves having their source in the invaded part are distributed. This also is paralysis. But the nervous power does not admit of restoration without first removing the cause of its suspension.

A more formidable case illustrating the same principle is when the interior of the arterial canal is diseased. The issue is the gravest and without warning. A stage of such disease arrives when the vessel, impaired in strength, will no longer sustain the usual interior pressure; it becomes disrupted, and the contents escape into the surrounding tissues of brain or spinal cord. Life is speedily extinguished, because the nerve-incentives to organic acts, as those of the respiration and heart's

action, are permanently suspended. Yet the substance of the nerve may have been in perfect health up to the moment of the invasion. More frequently, however, the nervous power is only partly suspended, and the organic functions continue, but at an inferior rate.

These instances illustrate the general principle that paralysis is less due to disease of the nerve centers of the brain and spinal cord, or of the nerve conductors, than to an invasion of these anatomical elements of the nervous system by something exterior to them, from which the nerves are compelled to suffer. The mechanism of the nerve substance is physically controlled and subverted.

The deterioration evidently begins in the *nutritive* department of the vital organism, and from imperfections thus arising the nervous mechanism ultimately suffers, while in the healthful and even vigorous performance of its functions. The nerve centers and conductors are not in the least diseased in the ordinary understanding of this term. They are simply crushed out and ruined from faults arising in other than nervous sources.

The actual disease, that which causes the calamity, is far from being sudden. It may date a long way back in the nutritive history of the individual. He has during this period

been subject to conscious or unconscious variations of health, owing to the existence and the progress of its cause. These oscillations doubtless correspond with the presence and absence of sub-oxides in the organism. The comparatively accidental circumstance of localization has the honor of bestowing the name of the disease; and unfortunately for the patient, of dictating a method of treatment essentially unrelated to the actual disease, and having little or no truly remedial power. For it is clear that causes which affect the general nutritive processes are just as influential in promoting or retarding the potential disease *after* its precipitation, as they indisputably would be *before* that event.

However this may be, it is difficult, even for the sufferer who has followed the above statements, to understand how remedies whose effects are intended for and are confined to the nervous system exclusively, can possess any curative influence on the actual malady; that which has caused suspension of nerve power.

But the invasion of the brain and spinal cord by something that produces suspension of its power in far the greater number of cases is gradual and progressive. On account of its insidiousness, no alarming symptoms arise till the disease is well established. The slow pro-

gress of these cases affords abundant opportunity for experimenting with drugs, chiefly those which relate to the nerve substance, rather than to that which causes its function to deviate from the normal standard. The results of such experimenting are usually void of instruction, as to advantages or disadvantages resulting from the use of drugs.

In these cases too, there is good evidence that the nerve centers are invaded by foreign substances as truly as when sudden effusion occurs. This foreign substance arises, however, from defects of local elimination; from imperfect changes of substance incident to general as well as local nutritive acts. The local residuals fail to be removed in proper time and degree. The capacity of the nerve cells to evolve power is diminished by local impediments thus arising, and gradual suspension of their product of nerve energy deprives the extremities of their normal power. The source of the suspension of nerve power lies therefore in the nutritive processes, and the remedy must consequently be of a nature to improve these processes.

The reader may more readily understand the nature of the difficulties under which the nervous system labors in regard to the disposal of its nutritive material, by calling to mind the con-

ditions for the perpetuation of muscular power.

The muscles, in contracting, evidently provide for the continued development of muscular power by the act itself. For muscular contraction not only invites blood, bearing food and oxygen to the acting muscles, but compresses the tissues of the region. This compression urges forward and effectually excludes the whole of the unemployed nutritive material, whose qualities are unimpaired for supporting other functional requirements, but which, locally, if retained, would immediately become a foreign substance and unavoidably subject to some form of deterioration of quality.

Every repetition of the muscular act therefore renews and refreshes the sources from which muscular power is derived. New material is supplied for continued manifestations of motor-energy, while the surplusage of mixed, stable, and unstable material is transferred to other fields of usefulness. The health of the muscles are thereby preserved indefinitely.

The central nervous system, from which arises all nervous power, sensorial, reflex, emotional, and intellectual, is differently situated in respect to renewal of nutritive material, and exclusion of its surplus with its semi-

elaborated waste. The brain and spinal cord, and indeed the protected cavities in which these organs lie, contain no voluntary muscles, and no muscular substance whatever, if we except the exceedingly thin coat of the sanguineous vessels. These organs, therefore, while they attract blood by their functional exercise, have not the least power to exclude blood, contained either in their substance or precincts. These organs are snugly inclosed in a bony case, which precludes their nutritive vessels from being directly reached, as are those of muscular parts, by exterior compression. Evidently, some other arrangement is provided in the constitution for the constant and complete removal from the cavities occupied by the central nervous system of the blood that is supplied to it through ordinary channels. When we discover what this means may be, for mechanically extracting fluids, with whatever ingredients these may include, from the central nervous precincts, we shall be in possession of a remedy which no combination of drugs can possibly parallel.

Much has been made in modern therapeutics of the discovery that by means of irritation, supplied medicinally or otherwise, to the muscular coat of the nervous capillaries, they are made to contract, and diminish for the instant

the inflow of blood. But no proofs have been given that this effect extends to the veins, or that the outflow can be sensibly increased; or that the *renewal* of local nutritive material, on which healthy nutrition of nerve depends, can in this way be secured, much less perpetuated. These latter consequences of remedies capable of affecting the muscular element of vessels of the nerves need to be shown, before their remedial effects should be admitted as true.

A review of the physiological situation shows the following facts: The cerebro-spinal centers invite and receive an abundance of blood. This blood contains material for the local nutritive uses, material locally unusable, and material imperfectly prepared for exit from the nervous precincts. The nerve tissue is of itself helpless against the intrusion of foreign substances, helpless to exclude even its own waste when this happens to be imperfectly prepared for exit.

Under circumstances such as these, it is little wonder that some one or other of a great variety of local pathological changes incident to central nervous system, is liable to occur. The local capillaries become compressed or distended. The local contents are inertly retained, and become fixed to the walls, or otherwise prevent onflow of the sanguineous currents, or become effused, and take on low vital forms such as

sclerosis, proliferation of connective or other tissue; or, the local nerve tissues, in the utter absence of interchange of supplies, deteriorate by softening, hardening, or other form of destructive change. In short, all the forms of disease discovered in post mortem inquiries, are liable to occur should the nervous masses of the brain and spinal cord be deprived of the *exterior conditions* necessary for the natural completion of the circulation of the blood in the bony enclosures occupied by the great nervous masses.

These statements afford abundant explanation of the reason of the general insufficiency of ordinary medication for local diseases of the brain and spinal cord. Such remedies are void of power to assist the distribution of the blood to any permanent degree. The causes of excess, both of quantity of blood in the cerebro-spinal centers and of its unstable ingredients, continues, and the deterioration incident to nerve tissue is sure to proceed, in spite of the report often false, of the sensations, under vigorous though futile medication.

There is no defect in the design or in the untrammeled operations of nature, in reference to adequate drainage of the cavities containing the great nerve masses. Nature has provided special departments of physiological mechanism and physiological activity for this very purpose.

The action of these is sufficient in health, and is easily increased to any degree required for the exigencies of the suffering nerves. The action referred to is equally capable of preventing and of remedying disaster to the nerves. It only requires a realizing sense of the facts stated, and the adaption of means to ends becomes almost instinctive.

The most obvious and at the same time the most extensive and powerful physiological provision for withdrawing from the cerebro-spinal axis its excess of blood, liable to precipitate local injury, both in its quantity and quality, is fully shown in the author's work on "Pelvic Therapeutics." This is what is there called the respiratory or organic rhythm—the slow, heavy, surging, or reciprocating motion in which the trunks of all animals are engaged through life. This motion is the principal means for effecting the return circulation of the blood to the respiratory centers, to be recharged with oxygen for its repurification. It is useless to enter upon further explanations and arguments than are there given. It is sufficient to say that it is there shown that the respiratory rhythm is perfectly effectual for draining the pelvis, and removing all excess of blood localized as hyperæmia, and congestion, and even morbid fixed products, as

hypertrophy and indeed all swellings, irrespective of distinction of kind.

Now, this same force, arising from the same source, is similarly effective, and to the same degree, in case of the nerve centers. Any marked excess of blood and of effused fluid, and all morbid derivatives thereof with which the nerve centers may be affected, are removable by extending thereto this natural physiological action.

This function of returning to the centers all outlying excess of fluid is a proper field for special remedial attention—in short, to cultivation—by methods definitely adapted to secure that end. And these methods are capable of causing even rapid improvement when properly adjusted to the individual's peculiarities.

Closely connected with the above is the counterpoising effect of ordinary muscular activity. Such activity, by the demands it makes on the blood for nutritive support of muscles, obviates the possibility of retention of excess in portions of the nervous system, as the head or spine; and renders paralytic affections impossible so long as such counterpoise is maintained.

But the paralytic is one deprived of muscular power and muscular action, and therefore of the wholesome effects flowing therefrom. And there can possibly be no permanent substitute,

medicinal or otherwise, for the physical consequences in the vital organism of the function of the muscle-cells. No other counterpoise is attainable. These facts render it perfectly plain what the remedial recourse must be. It is *mechanical massage*. This affords ample natural function to the muscle-cells, without the need for intervention of, or incitation by the nerves.

Mechanical massage, by engaging the blood in nutritive uses, produces actual physical drainage of the brain and spinal cord. This effect is easily carried to a high degree, and thus secures the removal of inert, deposited, and even deteriorated materials, hitherto offering local obstacles to manifestations of nerve power.

The combined physical effects above ascribed to mechanical massage result in *absorption*. The fluids exterior to blood vessels are caused to pass through their walls and mingle with the blood. Such adventitious matters become in this way subjected to the chemistry of the vital organism. This *absorptive* effect of mechanical massage, its power to break up adventitious and semi-organized matters, even causing them to disappear, is unique among remedies, and is particularly desirable and effective in cases of cerebral and spinal disease.

In this effect of mechanical massage the reader will perceive the specific bearing of what has been shown in preceding parts of this work, of the power of this agent to destroy excess of the unstable ingredients of the vital organism. No local hiding place, as within the skull or spinal vertebræ, is capable of protecting this class of material, under the circumstances. The increased oxidation is vigorous, and extends equally throughout the vital realm; and the most unstable, and therefore most noxious matters, are first removed, as is shown in preceding parts of this work.

The paralysis of children, followed by shriveling (atrophy) of the limbs and other parts affected, and also by contraction and deformity, differs from that of adults, as above shown, both in origin and consequences. It is usually caused by acute inflammation of the spinal nerve, sometimes including the brain. The injury to the central nerve destroys, or partly destroys, its connection with the limbs, but on subsidence of the original disease, the limbs fail to improve, but remain helpless and sometimes void of sensation; while the central nerve returns, in part at least, to its natural health.

Spontaneous recovery is seriously compromised, often entirely prevented, through

defect of the extremities, and the lack of the reaction upon the central nerve arising from their want of motor power. For, as is shown in "manual massage," all impressions on the nerves of the skin and extremities produce nutritive consequences in the spinal cord and brain with which the peripheral nerves are connected.

In general, the cause of the suspension of power of the extremities subsides spontaneously in the early history of these cases. There may remain local products of the original inflammation, but these are mechanical and inert. Unlike the class of cases last referred to, there is no intrinsic tendency of the disease to progress. It remains stationary from lack of physical conditions favoring development.

The treatment by mechanical massage of these invalids, even when great deformity has been caused by the defect of power, is always beneficial, and often very highly satisfactory.

These cases, which sometimes include the paralysis of the adult also, require those conditions for development which are supplied only by the action necessary and natural to the part in which the development is desired. The shriveled muscle-cells need to be subjected to alternations of change of shape; and the supply of this action, experience shows, cannot be over-

done. The amount of massage which any human hand is capable of supplying is far below the capacity of the shriveled tissues to receive with advantage.

Not infrequently muscles remain plump though powerless. In this case it is quite certain that the ordinary contents of the muscle-cells are lost, and fat has been substituted. In this condition no remedy is at all comparable with massage; indeed, massage in some form is the usual resource. Motion is not in the least compatible with fatty deposits, whether the lack of motion be owing to spinal or other causes. Massage at first often causes shrinkage of unwholesomely plump parts, because the absorption is rapid, while development is comparatively slow. The deformities, usually attendant, being consequences of infantile paralysis are removed as fast as the power of the muscles are restored. Attempts to remove such deformities more rapidly, by force, are sometimes showy, but often useless.

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RHEUMATISM.

In this disease, we have a conceded, recognizable offending substance; an imperfect or unperfected derivative of food, which is the essential element of the disease. This substance floats with the circulating blood, obstructs the capillaries at their narrowest passages, causes their distention by the impeded flow, and swelling of the surrounding parts. This substance accumulates in tendonous and membranous structures, provoking inflammatory and even febrile action. These evidences of a present morbid substance often shift from one to another part. It is finally discharged abundantly in the urine, and sometimes appears in the perspiration.

The details of the peculiarities of rheumatic disease are of universal interest, because they afford irrefragable demonstration of the correctness of the general principles this work is designed to illustrate.

It is generally known that the offending something, which coexists with rheumatic lameness, inflammation and pain, is a well defined chemical body, necessarily having its

origin in food; that it differs from the chief essential ingredient of food, from the composition of the substance of the vital acting tissues, and from the special form of waste into which these tissues become physiologically resolved for dismissal from the organism, only by slight variations in the proportions of the same atomic matter.

The so-called *nitrogenized* tissues of the body end their physiological career under the form of *urea*, which passes from the system with the urine. Urea is wholly derived from the nitrogenized ingredients of food, and contains the whole of its nitrogen. It is the physiological *end-product* of the chemical changes incident to the food containing nitrogen. Its production is as natural in the body as that of water, and it is as stable and as incapable of inflicting injury.

But, like most ingredients of food, there is evidence that this bland end-product may be reached by stages, that intermediate, unfinished products may exist, and that in a deteriorated condition of the chemical phase of the activities of the organism, a portion of the nitrogenized ingredients of food may fail of reaching the end-stage of their career, and therefore fail to pass in the ordinary way from the system.

The offending substance in the system associ-

ated with rheumatism is of this intermediate nature. The chemical products are imperfect in degree; the end-product is not reached; the chemical series of activities is arrested at an incomplete stage. The result is *uric acid*, when urea is due.

Uric acid has a similar composition, but very different physical qualities, from the natural or completed product. It is but sparingly soluble; it exists in definite concrete forms, as little crystals of appreciable size, even in the fluids of the body. It offers mechanical obstruction to the flow of blood in the minute capillaries, especially in the narrower capillary passages of the white tissues, the membranes, connective tissues, tendons, and other dense structures about the joints. Uric acid has been proved by experiments on lower animals to have undoubted poisonous qualities.

The reader will better understand the relations of the principle which causes inflammation about the joints, great physical disability and unlimited pain, and the nature of the only really effective means of removing the cause of the suffering by means of a familiar analogy.

Carbonic acid is also produced in the body by the vital chemistry, and is constantly and abundantly discharged in the breath. This

substance is perfectly stable and innocuous. But an inferior stage of oxidation of carbon affords, not carbonic acid, but *carbonic oxide*. When by reason of mistakes in the management of fires, as sometimes happens, this substance finds its way into the vital system by inhalation, the consequences are exceedingly prejudicial; it is poisonous. Though chemically related to carbonic acid, it is physiologically unrelated. Urea and uric acid in the vital organism have similar chemical and physiological relations. The one is innocuous and stable, while the other is not, and offers both mechanical and chemical obstacles to vital processes.

The reader who has given proper attention to what is said under a preceding heading: "What becomes of motor-energy transmitted to the living body by mechanism?" will now understand why mechanical massage, wherever known practically, has achieved the reputation of being *the* specific remedy for all forms and stages of rheumatic affections; why the local inflammation and the pain disappear, sometimes as by magic; and why the soreness, swelling, and stiffness incident to this affection often subside after a few applications of this remedy. These radical consequences result from the rapid conversion of intermediate and inimical ingredients of the sys-

tem into innocuous stable end-products. The career of nitrogenized material becomes finished, instead of suspended just before its last stage, and the product is dismissed, instead of being retained, and derivatives of food assume a wholesome instead of an irritating, poisonous form.

These results, secured by mechanical massage, are the direct effect of no other remedy; no oxidizing agent of inferior power is capable of this rapid and certain work.

The above details indicate that the remedial requirements of rheumatism consist not merely in increased oxidation, but of such energetic use of oxidizing agencies as compels even very resisting materials to yield. This statement is corroborated by the nature of the obstacle to be overcome, and also by experience in the use of remedies in general for this form of disease.

Uric acid is not a very unstable substance. On the contrary, it chemically approximates urea, which is stable. It follows, that its destruction in the vital organism is really difficult. Success often depends on the coincident aid of favorable conditions, especially as relates to hygiene. This is why popular remedies, and, indeed, the best medical skill so often fail. Instances of failure may be properly accounted for by the presence in the organism of other and

more unstable oxidable substances. These, of course, appropriate the oxygen which might otherwise be applied to the destruction of uric acid. A concurrent hygiene which restricts the over-abundance of soluble substances from entering the dietary, therefore becomes necessary in all difficult cases. The desired results are then secured with facility.

Another corroboration, is the fact that oxidizing remedies are empirically found to be of service in rheumatism, and under advantages above referred to often become remedial in a temporary, and the usually accepted sense. The alkalies, added to organic mixtures, predispose such mixtures to chemical activity in which oxygen becomes absorbed. Acids probably yield oxygen of their superabundance, under the circumstances presented. The iodides are simply substitutes for oxygen. These are all largely employed as rheumatic remedies. The empirical use of these, indicates the nature of the remedial effect produced, and also that *all* remedies which have acquired remedial reputation, favor in some obscure way, a more energetic oxidizing action, through probably a variety of channels.

Mechanical massage as a remedy for rheumatism has, in one important respect, immense advantage over all others, whatever be the suc-

cess claimed for them. This advantage consists in the completeness and permanency of its curative effects. It not only secures immediate reduction of the most resisting and least unstable of the sub-oxides which are liable to accumulate in the vital organism, but it also strengthens the oxidizing function, by complying with the strict requirements for *natural* and functional oxidation. This function becomes properly cultivated so that the process continues, normally, with no tendency to revert to the inferior degree, which gives rise to abnormal products. The cure is not mere palliation, but radical and permanent.

This is conspicuously opposite to the results of ordinary medication for this disease. The rheumatic invalid is well known to be perpetually inclined to relapses, and to new attacks; this is learnedly explained by the word *diathesis*. The significance of this liability, and consequent indefinite self-perpetuation of the disease, is simply this: The capacity of the vital organism for conducting her processes of expenditure to a completed stage and to a successful issue, is not in the least improved by ordinary remedies. They have no physiological bearing, in the sense of *continued* completeness of its processes.

A careful comparison of the remedial effects of mechanical massage with those obtained by

other remedies, is highly instructive, both to the physiologist and the therapist. Such comparisons account for the unsatisfactory and equivocal effect of ordinary medication in other classes of diseases where the vital powers have become seriously weakened, as well as in this. The comparison shows that the general principle dictating palliative medication is, in most chronic cases, radically unsound. For the destruction, by antidotal remedies, of a morbid, or toxic, or disease-producing substance, such as the cause of rheumatism is conceded to be, does not obviate its continued reproduction, and therefore implies the continued need indefinitely of the specific remedy. Medication under these circumstances is a sort of absurdity. Now, the development of the morbid disease-producing element, is not due to the need of an antidote, but the need of more perfect results of physiological activities. It is these activities, and these only, that are adapted to and capable of preventing the products from falling below the standard, and becoming thereby abnormal. The true physician looks beyond the emergency. The remedy chosen with reference to it is usually a mere palliative, having not the least relation to causes, and utterly fails to modify or obviate those above pointed out. The true remedy exalts the physiological powers

through the agency of their *natural* incentives, which act *continuously*, and therefore secure permanent results.

It may be superfluous to add that the best results are secured only by compliance with such dietary principles as are hereinbefore shown, under the head *Indigestion*, to which the reader is referred.

The rheumatic invalid needs to carefully heed the fact of the two distinct factors of his affection—the causative, consisting of uncompleted products of expenditure, and the impairment of locomotion, which is the accident arising from the tendency to lodgement in certain tissues of such products. The last named factor persists even long after the causative one may be removed, spontaneously or otherwise. It even reacts, and reproduces the causative factor.

This is because the impairment of muscular function has little tendency to self-correction. Enforced inactivity implies diminished chemical change superinduced normally by the most powerful agent of such change in the vital organism. The muscles shrink, become incapable of attracting nutritive support, and of yielding stable products of expenditure. While inactive, the end-products are diminished and intermediate, unstable products proportionally increased.

Self-restoration, therefore, becomes nearly

impossible on account of the impaired instruments of physiological duty. The energy necessary for the motor changes required for the desired chemical results must be supplied. Mechanical massage is the only well-proved adequate means of securing this end.

The impairment of locomotion is still further complicated by adhesions, that is, a gluing together of independent fibers which in a normal condition glide upon each other.

The weakened muscles are incapable of overcoming this kind of mechanical obstacle. The sticking together of fibers offers a combined resistance to the power of the muscles and prevents the latter from becoming effective. The muscular power is exhausted even by the resistance between its individual fibers, and is therefore unable to reach the muscle-ends connecting with the mechanical frame.

To remove this obstacle forced extension has often been employed, to overcome suddenly the mechanical bond. This is unnecessary. The minute movements of the adhering fibers which are still elastic, supplied by massage, are amply sufficient to cause progressive sundering of all fibers and membranes, and the desired extent of mobility is rapidly attained painlessly.

The forcible method of distention fails of the main purpose. It only sunders masses at

weakest points, but leaves the minuter parts unaffected by any mechanical force it is possible to supply. It only aims at *visible*, not interstitial and minute effects. Elasticity, suppleness, mobility are not increased by forcible distention, for it supplies no conditions conducive thereto. More than all, this method affords no cultivation of power, introduces no physiological change, causes no development. Whatever of these follow must be spontaneous, and unassisted by the instantaneous forcing method of dealing with deformities produced by rheumatic inflammations.

DISEASES OF THE KIDNEYS.

To be of real and permanent service, remedies for affections of the kidneys must have strict and undoubted relation to the causes from which such diseases arise, and in which they potentially exist. The trustworthy remedy must also be intelligible to the understanding of the patient who unwittingly has so much to do with the sources of his trouble. In these cases, it will hardly do to rely on the vital energies to come to the rescue and remove the affliction root and branch, while the patient is being variously entertained with palliative remedies. The patient needs to know that the portions of the disease most apparent, the albumenuria, the dropsy, etc., are only concomitants and consequences, and cannot exist in the absence of their sources; and that remedial palliatives are required only in proportion as the causes remain potent and active.

The prevailing indifference to the causes and initial symptoms of kidney affections, is scarcely creditable to the popular intelligence or to medical literature. For experience shows that every prolonged embarrassment of the functions

of the kidneys should be regarded as scarcely less than a foredoom of fate, and ought to inspire radical and thorough research, in place of the usual experimenting with deceptive and useless palliatives.

The nature and sources of diseases of the kidneys are best understood by studying the striking points of analogy their functions bear, both in health and disease, to another class of functions which are usually under closer observation and generally better understood. These are the organs of digestion.

The functions of the latter, are to introduce substances destined to nourish the body. It is the function of the kidneys to give exit to matters prepared for exit.

The membranous walls of the digestive organs not only permit the entrance of fluids destined for nutritive uses, but they serve the very important additional purpose of preventing the entrance to the vital system of insoluble substances, and matters in general incapable of service. In like manner the mechanism of the kidneys permits the escape only of certain qualities of material, which have previously been subjected to due preparation. The kidneys in health effectually prevent the escape of ingredients of the blood not reduced to certain forms and degrees of preparation.

The preliminary preparation required for admission of food is digestion—an act performed *in the cavity* of the digestive organs, not by their walls. The preliminary preparation for the dismissal of nutrient matters by way of the renal outlet consists in the fulfillment of nutrient purposes through perfect compliance with its processes throughout the vital organism; this purpose is not effected by the mechanism or the chemistry of the kidneys. Their healthful function is completed by *restraining* unprepared substances from exit. What the cavity of the digestive organs is to the physiological system, so is the latter to the kidneys.

As the analogies of the two classes of organs are, in health, undoubted and striking, so they will also be found, in equal degree, under deranging influences.

Whenever the digestive organs have been plied with excessive and unreasonable quantities and qualities of food, beyond the needs of the system, for a period sufficiently prolonged, the function of digestion will disclose evidences of imperfection and of suffering. The question of the quality of the food is not primary, but subordinate. The same or similar evidences will arise if the quality be unexceptionable. When the organism refuses to receive food, digested or undi-

gested, it becomes forthwith a local annoyance. The digestive secretions are withheld to protect the organism against further intrusion. Everything permitted to enter the system is inexorably submitted first to the secretions; their quantity and quality, which are definitely related to the system's needs, decides the question of further progress of whatever enters the digestive cavity.

In the case of excess above supposed, that which is beyond the powers of the function, necessarily remains in the cavity, unprepared for removal in the ordinary way. It practically becomes a foreign body, liable to decomposition. Its physiological and chemical adaptation to serve as nutriment, and the kindly intention with which it was ingested, cannot under the circumstances save it from being pernicious. It becomes subject, not to the vital chemistry of the organism, but to the conflict of its own unstable ingredients. The elements of the best of food are capable, in the cavity of the digestive organs, of resolution into most unwholesome secondary products.

The following consequences usually follow in a variety of degrees: The digestive walls become *irritable*, nervously, mechanically, and chemically. Local pain results from the impressions of new products. Hyperæmia, con-

gestion, and inflammation of different grades follow. *The digestive secretions diminish*, perhaps cease. These are replaced by an abundant outpouring of mucus; this, continuing, becomes serous—genuine effusion from the blood-vessels. The effused fluid washes away offending substances, dilutes the morbid contents of the cavity, and protects its walls.

The sufferer in the experience above depicted, need not be at a loss for an explanation of its cause and meaning. Excuse it as he may, he knows that the limits of the powers of the digestive secretions were exceeded. He knows that the disagreeable consequences were the shortest, wholesomest and safest way nature had for securing relief from the dilemma into which his acts, his gustatory temptations, unregulated by reason, by observation, and by personal previous experience, had plunged him.

Now, note the morbid parallelism of the kidneys. Their function consists in facilitating the escape of *prepared* products, and to prevent or hinder the escape of those unprepared. The digestive organs, in like manner, introduce nutritive supplies to the vital system only after due preparation, and exclude all unprepared substances.

As digestion is a specific act, due to a specific cause, so the preparation of the same substances

for escape from the organism is acquired by specific processes, in which the *whole organism* is engaged as truly as the digestive organs are engaged in their functions. Assimilation and dissimilation and concomitant systemic oxidation, is as essential a preparation for the *exit*, as is digestion for the *introduction* of food. The two are the extreme factors of the nutritive processes, without which the intermediate processes, whereby energy is evolved, are impossible.

The morbid parallelism of these leading functions is even more complete and striking than the physiological and functional. For, as indigestion results from a want of proper relation between food ingested and the secretions adapted to digest it, so kidney failure naturally results from a want of proper relation between the preparation by the system at large for its exit-materials and the kidneys, the physiological instruments to which this function is assigned. The rational inference is inevitable. Nutritive material in some form is in habitual excess in the blood, seeking passage through the tissues of the kidneys. This, to these organs, foreign material, is a cause of irritation, just as is known to occur in the digestive organs, and degrades their function. Here comes in the absolute need of analogy to show what occurs beyond the direct

sphere of the operation of the ordinary senses. Persistently outraged function of the kidneys, gradually superinduces morbid changes of substance of these organs. The rectification of these organic difficulties is hopeless while the cause persists, but *very hopeful* from the time of their discontinuance.

The above statements are not made in disregard of the modern physiological doctrine which encourages superabundance and assumes the capacity of the vital system to convert food into forms for exit in *excess* of its nutritive uses. In regard to the facts appearing to justify this doctrine, it should be remembered that the subjects for this class of experiments have been the lower animals whose habits disqualify them for a just comparison with man; that, as we elsewhere show, all animals, including man, have actual physiological provisions rendering them capable of tolerating temporary excess of nutrient matters; and, further, that all experimenters with excessive feeding have ceased their observations too soon. The morbid condition of the kidneys requires time and persistency for its development, and for reasons above stated invariably escapes detection in its early stages. In this respect the parallelism of the renal with the digestive organs, which are the natural protectors of the kidneys, ceases. The conse-

quences of food in excess of expenditure are the records of pathology, from which physiology is distinct.

Taking *albuminuria*, or the escape through the renal apparatus of a portion of the nitrogenized constituent of food, to be the evidence of kidney disease, the *cause* is neither obscure, unintelligible, or even difficult of prevention and remedy. For the matters seeking and finding exit by the kidneys in case of incipient and of developed disease of these organs are emphatic evidence of the unequal ratio between those entering by way of the digestive organs, and the sum of the functional processes by which these become *prepared* for exit. A portion remains unprepared. More nutrient materials pass the digestive boundaries than is made use of for the aggregate expenditures of heat, muscular and nervous power. The residue is detained for future use, in default of which its annoying presence is manifested through the outlet designed to be traversed by it after having been prepared.

The *albuminoid* form of the residual presenting at the kidneys, disturbing their function and precipitating disease of their substance, is the consequence of the principle in physiology explained on preceding pages, relating to the

degrees of stability of the intermediate ingredients of the organism.

Decidedly the most unstable are the saccharine group of aliments. This ingredient of food is therefore more rapidly and completely oxidized than any other. It is a well established physiological fact, that a portion of the products of digestion reach the circulation through the liver, in which organ they are transformed to glycogen, a saccharine substance, evidently thus facilitating its oxidation.

When, therefore, the physiological oxidizing functions of the organism is incomplete, it is the relatively more stable albuminoids which escape the process. In case of insufficient oxygen, the more unstable ingredient may be said to appropriate from this element, filching, as it were, what belongs physiologically to the less unstable; the organism becomes relieved of the one while the other remains.

This representation of the causes of the insidious and fatal maladies of the kidneys is completed by designating the practical acts and circumstances which conjoin in their production.

1. Excess in the use of *soluble* food of any and all kinds, denies the digestive organs the exercise of one of their *leading* functions—the function of excluding. Soluble food, or rather, food not requiring digestion, is a surreptitious

introduction of aliment, avoiding challenge by the guards. That which bears no relation to the current expenditures is liable to be introduced. The secretions, which ought in some way to represent the system's needs, are not consulted.

The modern craze for pre-digested, semi-digested and artificially-digested food, and also for an excessive addition of sacharines to food, are the principle ways of circumventing digestion, and, therefore, of over-working the kidneys. The organism is thereby invaded by a large contingent of foreign albuminoid ingredients.

2. While the least stable of the intermediate changeful ingredients of the organism are readily removed by physiological oxidation, even under the most unfavorable circumstances, the more stable, which embraces the albuminoid series of the derivatives of food, absolutely require *motion* to effect this object. The person who has least voluntary activity to reinforce the chemical effect of the involuntary motions, is most exposed to the consequences in the form of albuminoid residuals to perplex the kidneys; and if, at the same time, he be not careful to *avoid* those forms of aliment that require no digestion, he is already verging toward incipient disease of the kidneys.



The control by mechanical massage of the excess of unconverted albumen of the organism is incontestible. Under its use the albumen disappears from the urine, even though the kidneys have become so far impaired as to preclude restoration. Instances where the urine under the usual test of heat was wholly solidified have shown scarcely a cloud of albumen after two or three weeks' use of the mechanical massage.

An incidental effect of mechanical massage in these cases is of great value. The *dropsical* symptom, which is of common occurrence, is at once relieved, even though severe, and though the kidneys are hopelessly diseased. This is probably the combined effect of mechanical and chemical influences superinduced by the massage.

Physicians have learned the utility of a special dietary, and usually consider this indispensable in all cases and stages of disease of the kidneys. But they are far from being agreed as to what this should be. Under the circumstances, a special is a restricted dietary.

Without clearly understanding the principles of mechanical massage, the dietetic plan of treatment virtually concedes some of the leading points urged above. One is, that the derivatives of some classes of food are more oxidable in the vital system than others, that is, that there

are differences of *stability* in the different intermediate ingredients of the organism; another is, that it is possible to promote the oxidation and removal of the physiologically more stable ingredients of the blood; still another is, that by omitting the unstable ingredients of food, the relatively more stable have a better chance to complete their chemical career, since physiological oxidation becomes intensified by the omission of substances strongly competing for oxygen.

The dietetic treatment alone is, however, insufficient to cover the "indications." It supplies nothing to the working mechanism of the vital organism, which, as has been shown, is largely instrumental in health in securing the desired *degree* of oxidizing effect, through the agency in its spontaneous motor-energy. Dietetics are palliative; but this effect is necessarily transitory, because food has no influence in directing the energies of the vital system into its motor instruments. This purpose should be the leading one, in a truly philosophical plan of remedying this unnecessarily prevalent and fatal class of diseases. Mechanical massage has this purpose and produces this effect, and this is why mechanical massage in diseases of the kidneys may rightly be called supreme as a remedy.



THE DELUSION OF TONICS.

Considered in relation to popular medicine, this is an age of "tonics." What bleeding and purgatives were to our fathers, tonics are to us. Most of the physical ills of life are now conveniently classed in the category of weakness, and tonics, therefore, become the unquestioned remedy. The theoretical purpose is to overcome disease by opposing one of its evidences—defective power of muscle and nerve,—although the evidence as relates to the latter consists in increased manifestation of activity.

Under the conception that weakness is a primary malady, physicians are called upon to ring all possible changes on the numerous so-called tonic drugs, with which they readily comply in seeming approval. The periodical press staggers under its burden of tonic advertising; the dead walls loudly proclaim tonics; and the wayside rocks re-echo, tonics. It is scarcely a wonder, therefore, that under such constant iterations, men and women are imbued with a feeling, readily finding expression on the commercial side, that tonics are the most important means of retaining and regaining

ing health. This result accords with that weakness of human nature which is ever inclined to take advantage of promised immunity for transgression, without being over particular about the origin of the promise. It is deemed easier to cure an ill than to inquire into its sources, as a guide for correct conduct.

The too ready concession that remedies are really capable of imparting actual power and wholesome activity to the vital organism, is an enormous source of boundless ill to humanity. So far as this proposition is actually believed, it offers immunity for transgression of the laws of life and health. It seeks to render such laws nugatory. This concession fosters ignorance of the first principles of physiology. If the consequences of transgression and evasion are easily removed, why need there be compliance?

The intrinsic nature, physical and chemical, of the drugs included in the list of tonics, renders it difficult to comprehend that actual physical power can be gained from their use. This class of medicaments are in general composed of mixtures of drugs bitter and nauseous to the taste and smell, the guardian senses of the interior of the vital organism. These senses are pacified and the dose rendered tolerable by plentiful commingling with alcohol, sugar and

aromatics. The first named are the essentials, the last appease the revolting sense.

It is not assumed or believed that any of the essential ingredients are capable of becoming organized or incorporated into vital structure; or that they suffer any change whereby they afford any sort of power; or that they have the least capability of developing energy in the physical sense; or that they are capable of adding in any way to the substance or to the powers of the vital organism. These are the purposes of food, effects derived from food, and appear only in consequence of the series of processes in which food, and only food, is capable of normally engaging. The tonic drug is neither food nor a substitute therefor.

The correctness of these statements being admitted, it becomes necessary for the advocate of tonics to assume that, although incapable of engaging in vital relations, tonics may yet have the property or function of inducing, urging, or compelling nutrient substances to become employed to better physiological effect, or advantage. This, in fact, is the position to which advocates and devotees are alike driven. It therefore becomes necessary to examine with some care the evidence on which this conclusion is based.

The inquiries naturally arising in the minds

of honest inquirers and seekers of truth may be condensed in the following:

Do the nervously and muscularly weak derive benefit from stimulant and tonic medicines, so-called? and if not, how is the delusion that they do, perpetuated, considering the great amount of experience which should correct it? The full answer to these inquiries appears to divide itself under several heads, which may be discussed in turn.

RELATION OF THE NERVOUS SYSTEM TO SO-CALLED TONICS.

By far the most conspicuous as well as seductive of the evidences adduced for the assumed beneficial effects of this class of remedies, are afforded by the nerves. These are the effects by which the invalid, who is constantly watchful of his feelings, judges. But he judges prematurely and before the evidence is all put in. He limits his conception of nervous power and nervous integrity to one kind of evidence, and neglects those outside the domain of the sensations. Variations of the consciousness are quickly procured by the intervention of drugs, which have no connection with the health or its improvement. Tonics make the sufferer *feel* better. This he improperly takes to be evidence of benefit.



But the evidence is not merely inconclusive, it is deceptive. It leads to the error of repeating doses entirely unrelated to his trouble, the effects of which correctly estimated may tell in the opposite direction. The correct estimate of effects would be the aggregate of energy arising in consequence of the remedy, from all its sources in the vital organism. The feelings are a partial and untrustworthy arbiter of the facts in the case. The judgment, based on the report of the nerves of sensation, is a product of delusion.

No doubt almost any extent or kind of unease of feeling may be allayed, even suppressed by certain drugs. But diminished sensibility thus secured is not a consequence of, or even compatible with returning health. It is the result of interference with the process of nutrition from which nervous power or energy arises; or with the connection of the nervous power with the consciousness. So far from indicating increase of strength, this evidence of so-called tonic effects may, therefore, point in exactly the opposite direction.

If the so-called tonic effects which so delight the devotee should arise from the opposite cause, namely, an increase or stimulation of nutritive activity of the nerves, the evidence is just as far from indicating an increase of the

general powers of the organism, or even this nervous power. It only means increased expenditure of some local nerve centers, and necessarily at the expense of some other function. The remedy only effects a turning of nervous currents into special channels, which, if continued, cannot be otherwise than misleading and delusive, probably, in the end, disastrous.

A true remedy must at least be harmonious with the purpose of the individual's existence. This purpose, physiologically speaking, is the development of the energies of the vital system to the extent of the organic capacity, and to maintain these subject to the will rather than the miseducated and deluded feelings.

All strong manifestations of feeling and of the senses, especially if prolonged, are necessarily at the expense of the other powers of the organism, unless it can be shown that such manifestations are without nutritive sources, or that they cause increase of the aggregate of power of the organism. It follows that the force and influence of the will are restricted by the excessive interplay of the sensations and feelings, and that one's individuality, in the sense of power, is diminished thereby. Whatever medicinal methods lead to such consequences should be regarded as illusory.

Let us look at the practical bearing of tonics. In so far as this class of remedies appease the feelings they assume the aspect of *tipples*, of the alcoholic variety. The acknowledged tippler has recourse to means very similar, under precisely the same inducement, and having the same purpose, which is to produce a better state of feeling. He, too, insists on the necessity for the daily, perhaps hourly, dose to keep up and improve his strength. He, too, is careful to allow no other test of his actual aggregate energy or power but that indicated by his sensations, and the sensations therefore control the dosage.

Addiction to tonics is common, and is undistinguishable in principle and in ultimate consequences from addiction to narcotics or alcoholics; and not unfrequently the former are composed of the two latter ingredients. The less palatable ingredients require the more palatable and potable to make them acceptable. In either case, what is at first tolerated from medical motives, becomes a necessity, on account of the falsification of the senses that is superinduced. In either case, the remainder of the physiological system is subjected to neglect, while the whole resources of physiology are concentrated on the means for comforting the feelings, under

the delusion that the whole vital system is being benefited thereby.

Such a person labors under a grievous practical mistake, not only in respect to his estimate of his strength, but as to the legitimate and only means of cultivating it. The trouble arises from basing the judgment on feelings, however superinduced, instead of on the physiological balance of the several orders of energy represented in the vital organism. In health the system is a harmonious whole, composed of parts mutually interdependent, and this harmony is destroyed when the sensory function is placed in control.

A single instance connected with the nerves will illustrate the general incompetency of the nerves alone to afford a true or practical estimate of the health. Paralytics frequently insist that their health is unimpaired except as relates to the power of sensation or motion as the case may be; when in fact, the disease, which is behind and the cause of restricted power, has probably had prolonged incipient existence, which the experienced physician knows betokens from the first a fatal issue. So it is possible, indeed practicable by art, under the name and guise of tonic remedies, to render the victims perfectly content with the delusion that they are improving in health, while the very foun-

dation of physical existence is being undermined.

MEDICINAL STIMULANTS AND TONICS AS AFFECTING THE
INGESTION OF FOOD.

The popular reason assigned for the use of this class of remedies is that of increasing the appetite, and therefore the amount of food ingested. This is a delusive reason. They have little or no power to effect either purpose. Like all foreign substances admitted to the stomach, the pungent and bitter substances composing the remedy causes a certain kind and degree of irritation of the membranes in contact, and especially of the nerves distributed to them. But the sensations thus produced are not appetite, although they may be mistaken therefor by those expecting that effect. It does not indicate a sudden creation of need in and throughout the vital organism for an increased supply of nutrition, which is the sole foundation for appetite. Such local digestive irritation cannot therefore increase the amount of food employed by the vital organism, and therefore cannot increase the average consumption of food, even should an immediate increase of food be consumed.

But another obstacle is equally fatal to the theory of increase of appetite. The irritation of foreign bodies in the stomach does not usually increase the digestive secretions. It is not the digestive, but the *mucous* glands which become excited from that cause. The purpose of mucus secretions is not digestive; they have, in fact, no digestive power. They afford *protection* to the delicate tissues of the walls of the digestive organs, against the effects, mechanical and chemical, of the intrusion of foreign bodies. The secretion shields the digestive walls, and neutralizes the asperity of the non-nutritive body introduced. The idea entertained by the undiscriminating that the digestive sensations, the digestion of food, and the uses by the organism of food are increased by the effect of tonic remedies on the digestive organs, is therefore a mistaken one, in spite of the testimony of the senses and imagination combined. The simple fact that the digestion of food has little or no control of the uses of food and of its ultimate physical and physiological destiny, is conclusive evidence that tonics have no such influence on digestion as that popularly assigned to them.

TONICS, AS RELATED TO THE INCREASE OF STRENGTH OR ENERGY.

The above-noted fallacy is but an outgrowth of a belief, more frequently implied than expressed, that the vital system is in some way capable of accumulating energy or power through digestion, which may be reserved or stored for subsequent use. That there is in animals, and in a limited way in man, a capacity of reserving nutritive materials, is obvious. But that the principle is inapplicable and unsafe if applied to energy is shown by reference to the conditions required by the most obvious and easily traced form of energy—vital heat.

It comes within everyone's observation that the heat produced within the vital system varies in amount in the exact ratio to heat-loss, or expenditure. The temperature of the body in health does not fall with increased exposure to causes of loss, nor does it increase when heat-losses are diminished. Variations of seasons and of clothing do not much affect the absolute and uniform bodily heat. This is because the heat-production constantly varies with the variations of the needs, which are the real incentives to such interior acts as result in developing this form of energy.

The higher forms of vital energy, those

arising for specific muscular and for nervous expenditure, are obviously amenable to similar laws. The development of these forms of energy are manifestly not in the least controlled by the caprices of appetite, as affected by stimulant and tonic remedies, any more than the development of heat can be controlled by similar causes. It therefore becomes evident that the impression that the muscular and the nervous power may be increased by remedies has its source and termination in the feelings and the desires, and that when reduced to a question of fact, is singularly wanting in evidence; it is a delusion not difficult of detection when submitted to appropriate tests.

TONICS, AS TONICS.

After admitting, as the reader must, that a portion at least of the function of tonics consists in toying with the feelings, and especially with the gastronomic sense; and in giving play to a laudable desire to increase the sum of the energies of the vital organism in ways not quite legitimate, he may still insist that there must be some foundation, however restricted, for the traditional belief that medicinal tonics may, in some way, serve a beneficial purpose. *Recent advances in medical science appear to*

prove the correctness of this inference. But unfortunately for traditional theories, their poor advantages are brought about in a way exactly opposite to that heretofore held to be true; and also in a way to confirm, in a most emphatic and unanswerable manner, the correctness of the positions herein taken.

A course of experiments was not long since undertaken to determine the relative as well as positive strength of the various preparations of pepsin, so abundantly thrown upon the market and perseveringly advertised. These experiments extended quite beyond their commercial bearing, and included the effect of additions of various drugs and mixtures of drugs to the digesting food-substance, under strict, test conditions. The experiments naturally included those drugs usually employed as stimulants and tonic remedies, which are assumed to *increase* digestion. These carefully repeated experiments proved conclusively that in every instance of such additions, the digestive process was *retarded*; and that the delay was in proportion to the amount of the drug added to the digesting substance. And as the climax to these observations, it was found that those drugs which have greatest tonic reputation and are most in use as tonic remedies, of which the preparations

of iron are typical, actually produce the greatest delay of the digestive process.

These observations, thoroughly establishing indisputable facts, unfold the secret of the effects of tonic remedies. They retard digestion and delay the process during the passage of the digesting materials along the first and most important portions of the digestive cavity. In consequence of the delay, a portion of the aliment escapes digestion, or, at best, is insufficiently digested and unable to pass the digestive walls, into the general system. The results are similar in fact, though very different in superficial appearance, to those arising from the use of purgatives. For, whereas the latter close the channels of absorption by their effects on the mucous membranes, the former obviate absorption by preventing the liquification of food by the digestive process. In both cases the partly changed food is discharged as residual.

The consequences of diminishing the absorption of nutritive matter, prepared or unprepared, is easily understood. It gives the respiratory function a much-needed advantage. The organism is thereby enabled to carry forward the nutritive processes to their chemical completion. The quantity of the true or perfected products of waste is increased, and there-

fore the amount of energy dissociated from food. Nutritive material, instead of oppressing the vital organism by lingering within it in some form of sub-oxide, ready by its instability to engage in some pathological process, becomes summarily reduced to the end-form, equivalent to exclusion. This is impossible when fresh supplies of unstable food materials are introduced without restraint. The reputed tonic exercises this practical restraint; the vito-chemical processes become intensified, and for the time, successful. The proper ratio between the introduction and the use by the organism of food, is restored, in spite of excess of ingestion. The tonic, for the instant, practically annuls the excess.

These undoubted good effects are, however, more showy than real. No provision is made for the food subsequently ingested. No permanent perfected relation between ingestion and respiration is established. No activity of the vital organs tending to superinduce increase of subsequent oxidation is assured. A repetition of a similar dose, which prevents or partly prevents digestion, is required to secure repetition of the effect. But the digestive organs are certain to weaken and finally fail altogether, in case of similar habitual treat-

ment. The tonic, as a tonic, is a manifest delusion.

MORAL CONSIDERATIONS.

Two distinct and noteworthy classes of influences extend to the moral nature, from habits of dependence on so-called "tonic remedies." Their influence tends to obscure and to pervert the moral perception and to countervail moral distinctions to a degree depending on circumstances, such as the nature and extent of the indulgence, and the temperament of the individual.

It may safely be assumed that the lesser degrees of the evil effects, though prevented by the reasoning faculties or other causes from gaining ascendancy, still are but fractional parts of the greater, and have the same tendency, though less power.

It may also be assumed that the distinction of stimulating and tonic drugs, founded on the time in which the effects become conspicuous, are subordinate, and may here be neglected, since general laws are the present object of inquiry. Whether exaltation or depression of brain and nerve be sought, or some peculiar influence on the digestive organs, or on the circulation be the *direct purpose*, it is some degree or kind of pertur-

bation or change of the feelings and of the sensations that is included in the effects in each case. These effects extend to the moral sense, so far as this is dependent on the physiological senses and activities. A certain degree of moral consequence follows closely upon physiological aberration. The proof afforded by the effects of some drugs in which these consequences are conspicuous doubtless extends in lesser degrees to those in which the immediate effects are more obscure. The temporary differences are sunk in the comparison with those that are permanent. This latter may be expressed as the subordination of the moral nature to the control of the perverted sensory powers. Every community affords doleful examples of the moral wrecks produced by tonic addiction. They are the prey of their own inordinate nervous activity, the morbid nature of which they are incapable of realizing. They are the supersensitive dyspeptics, the hypochondriacs, the miserable and physically incapable of both sexes, who are ever trying to be strengthened by tonics. They are first and last the victims of extreme perturbations of the senses; they have little perception of good in other causes than those producing reaction in their feelings.

It is obvious that men and women have no moral right to make such disposition of their

powers and faculties; or to allow the sensorial and emotional nature to override the physical harmonies of the organism. All have duties and obligations to those with whom they are socially connected which cannot be abandoned without moral culpability. Every one is responsible for preserving in wholesome order his physical powers, especially its nervous department, because it is intimately associated with his moral being.

But the subversion of the moral sense through the influence upon the judgment of perverted senses, is but a minor portion of the moral phase of the tendency of so-called tonic remedies. The greater demoralization consists in the disrespect for the obligation of law which is directly fostered by any consideration, medicinal or otherwise, which teaches, directly or indirectly, that the penalties of law may easily and without shame be obviated. The doctrine of penalties, commensurate with infraction of law, is a necessary guide for the understanding, and is applicable to all cases coming within its scope, and equally so to those beyond.

If suffering and illness be a necessary consequence of physiological missdeeds, known and unknown, then confidence in the efficacy of the tonic remedy is also confidence in its power to *obviate* penalties. But the absence of penalty

is the absence of law, and removal of penalties is the abrogation of law. The distinction between physiological and therefore of moral right and wrong is annulled the moment the difference in the consequences are removed. The absurdity of such doctrine and practice is manifest; and the assumption of the efficacy of the means for producing these effects, falls to the ground.

The mistakes of the judgment as affecting the moral sense, arise in a way pointed out in previous paragraphs. The transient feelings so easily produced are regarded as permanent effects, while the actual permanent consequences are ignored. Nothing can be more dissimilar, as is proved by the sequel which never fails to follow, whether regarded as such or not.

THE NON-DELUSIVE TONIC.

The idea that the bodily powers are susceptible of being increased—strengthened—is, however, far from being illusory. These powers are obviously subject to variations of degree, depending on the conditions under which they are manifested. It is only the fatuous modes of seeking the end, by complying with only a part of the necessary conditions, and this in

illegitimate and inconclusive ways, that are proper subjects for criticism.

Bodily strength is of course supported, maintained, and increased, only through one channel, the nutritive. While tonics seek to supply proper food, to insure its digestion, and to promote its distribution by means of the circulation of the blood — physiological acts eminently worthy of respect—their purpose is at this point practically abandoned, unfinished. Nutrition includes further processes; other requirements must be complied with to secure its consummation. The way to the vital, acting cell, where the evolution of vital energy actually occurs, remains to be opened. The débris of preceding acts, the impediments, must be removed. This last requirement is actually the first in physiological order; the indispensable necessity, the absence of which renders the rest nugatory, and the expected product of strength impossible. The act of the vital cell, evolving energy, is the grand aim which is unreached by tonics, and not even contemplated by those craving the advantages proposed through them.

It is only at this point that the co-operation of that indispensable factor of nutrition, oxygen, is supplied. The conditions for the

supply are use, expenditure, always the concomitant of the evolution of vital energy.

Nutrition is completed and the development of strength is secured only by the attainment of the end-forms of nutritive material which contributes power. As above shown, ordinary tonics fail to even contemplate this necessity, since it is secured throughout animated nature by the motor-energy of the creature itself; in its use and expenditure of nutritive material.

It is at this point that help is needful—is, indeed, *tonic*. The diseased, feeble, helpless, fail in the automatic supply of motor conditions. Mechanical massage comes in and supplies the defects. The motor-energy it provides secures the end-form of nutritive substance and even of nutritive residuals; and the capacity for voluntary power rapidly returns where it is supplied. The long-sought tonic, after many devious wanderings in its search, is found.

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